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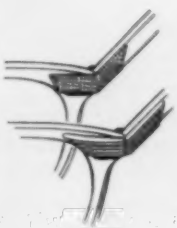

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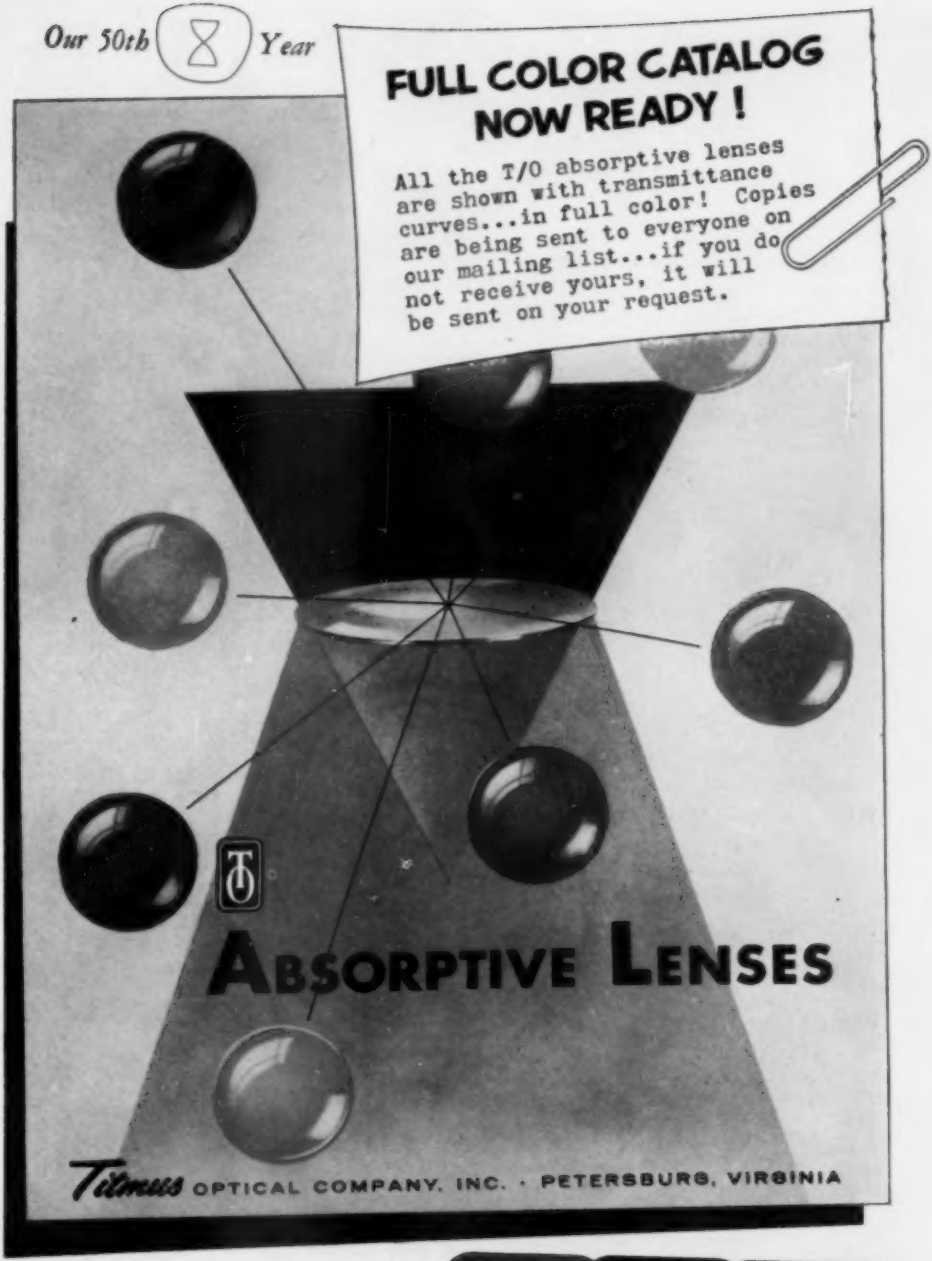
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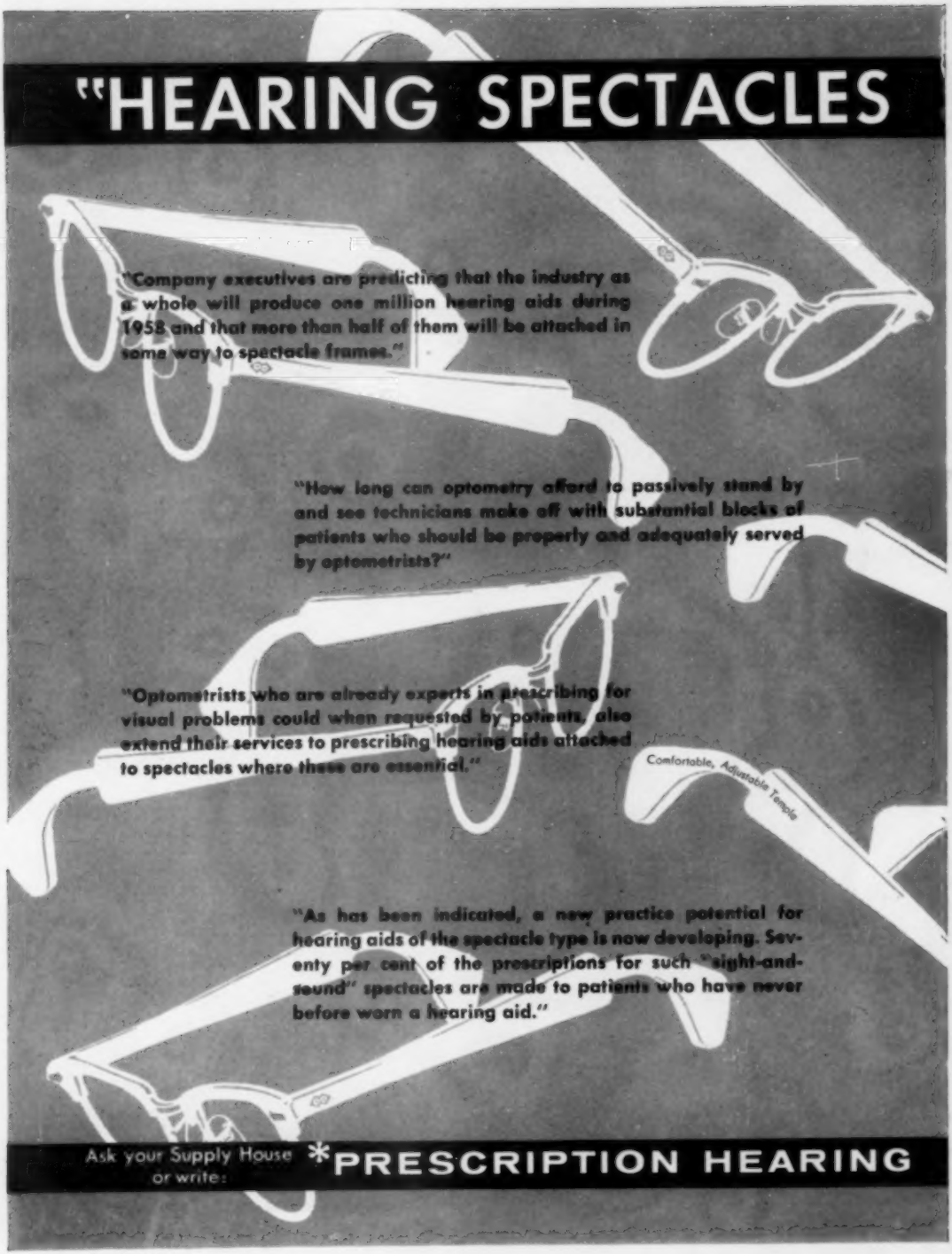
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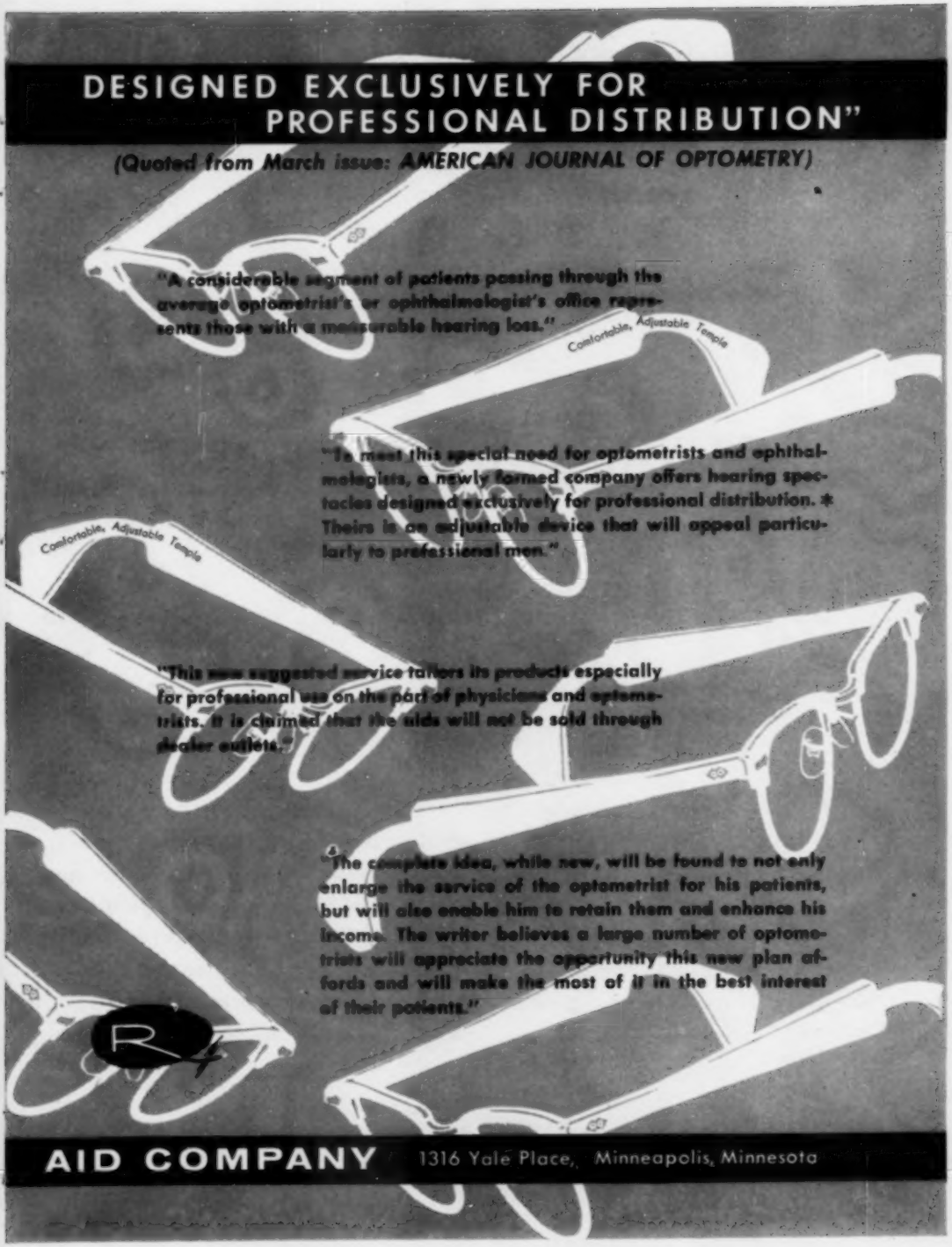

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RELATIONSHIP BETWEEN THE KEYSTONE VISUAL SKILLS TESTS WITH READING ACHIEVEMENT AND INTELLIGENCE*

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and
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Jamaica, New York

INTRODUCTION

Vision is one of the most vital senses for learning. Seventy-five per cent of all study activities in elementary school require reading ability.[5] Furthermore, 80% of the reading, writing, and other school achievement is dependent upon the child's ability to see properly.[5] It has been said that reading ability, interest in learning, and perhaps even intelligence can suffer from faulty visual skills.[3]

The present study deals with the relationship between: (1) The Keystone visual skills tests and reading achievement; (2) the Keystone visual skills tests and intelligence; (3) the Keystone visual skills tests and both reading achievement and intelligence.

The relationship between the Keystone tests with reading achievement was determined by investigating the following:

(a) Individual vision skills with below average reading scores:
(b) Individual vision skills with above average reading scores:
(c) Comparison of vision scores of above and below average readers:
(d) Comparison of reading achievement scores in different vision categories:
(e) Comparison between the number of above and below average readers, passing and failing the two visual levels of 95-100% and 88-100%.

In determining the relationship between the Keystone tests with intelligence, the mean I. Q.s of the three vision categories were compared. Also, mean vision scores of the three I. Q. ranges were compared.

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†Educator, Northport Public School System.
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Each of the three I. Q. ranges was then divided into the number failing and passing the two visual levels of 95-100% and 88-100%. Comparisons between those passing and failing were determined to see if visual ability followed a pattern in the various I. Q. ranges. The significance of the comparison was determined by the chi square method.*

In determining the relationship between the Keystone tests with reading achievement and intelligence, correlations were computed between reading scores with individual visual skills, in each I. Q. range.

Certain terms have been used in this study which should be defined to facilitate clarity:

1. Reading achievement—the scores received on the Stanford achievement test, Form KM; this is an average of the grades received for paragraph and word meaning;**
2. Average reading score—a level of 5.06 to 5.26 for children in the fifth grade, and 6.06 to 6.26 for children in the sixth grade;
3. Below average reading score—any score below 5.06 for fifth grade students, and 6.06 for sixth graders;
4. Above average reading score—any score above 5.26 for fifth grade children, and 6.26 for sixth graders;
5. Kurk and Steinbaum standard (vision score or rating)—a standard enabling a percentage score to be given for each child's vision, as judged from the Keystone screening tests; this is also referred to as the K-S standard;***
6. Visual categories—three levels of visual performance utilizing the K-S standard. These are: *Passing* (no apparent visual problem) 95-100%; *Marginal* (mild visual problem) 88-94%; *Failing* (severe visual problem) 0.87%;****
7. Variables of vision (visual skills)—refers to the Keystone visual skills tests, which consists of seven distance and five near tests. Tests dealing with color vision were not used because the writers are in agreement with Harris who has indicated that there is no evidence supporting the contention that color blindness affects reading ability (1:p. 207);

*The significance of all chi squares was determined by Garrett, Henry E., *Statistics in Psychology and Education*, 3rd Edition, Longmans, Green and Company, P. 465.
**The Stanford Achievement Test, Intermediate Reading Tests, Form KM is published by World Book Co., Chicago, Illinois. Form KM is printed on IBM Form I.T.S. 1010 B 3949.
***The K-S Standard was developed by the authors. See Reference 7.
****The visual categories used were taken from above reference.

8. Keystone telebinocular*—a stereoptic instrument with which any desired distance in space may be simulated. The Keystone was used to simulate two points:

A. Infinity—similar to the twenty foot distance of wall charts used in testing visual acuity:

B. Sixteen inches—similar to the near-point reading distance.

In this study, 100 native born children in the fifth and sixth grades of the Roslyn Heights School in Roslyn, Long Island, with an intelligence quotient of 90 and over, were tested.** Students were given visual screening tests at the time of year when they were receiving their general achievement tests in reading, and the scores on these tests were used for the purposes of this study. The intelligence quotient of each child was taken from the school records. The subjects were divided into three I. Q. groups (90-110, 111-120, over 120) and were also divided into above and below average readers. Total vision scores in per cent were also assigned and the subjects were divided into three vision categories: Passing, Marginal, and Failing. The Keystone tests were administered under the supervision of Kurk.

All children went through two phases of testing. The primary step was an interview to determine if they wore spectacles. No child was considered for the study if he wore spectacles and did not have them at the time of the testing. The next phase was the administering of the Keystone tests.

In reviewing the research, the writers found that various procedures were used for screening. The selection of the best type of skills test must necessarily depend upon the age, mental ability, and language development of the persons to be screened. Another important point is the time available for administering this test. As such, the Keystone visual skills test was selected as the means for obtaining the minimum skills deemed necessary. It is not the purpose of this study to evaluate the telebinocular test. Kurk, in his professional capacity as a refractionist, assumed it to be a good criterion on which to judge visual performance.

The Keystone test was graded using the K-S standard. The writers felt that a numerical score should be used since:

1. It would facilitate statistical work:
2. Ranges for the degree of visual status could be determined:

*The instrument used was the number 38 telebinocular.

**The study was limited to native born children to eliminate the possible handicaps that foreign birth might have on the reading achievement scores.

3. School and health officials could more easily understand visual performance on the basis of a percentage score.

A number of studies have dealt with the relationship of visual skills to school achievement. Harris,[1] in discussing the results of some writers, stated that poor fusion had been uncovered in many instances where children exhibited poor reading. He also stated that a study by Witty and Kopel found faulty fusion in 29 poor readers and only one good reader: Eames found fusion difficulty in 44% of poor readers and only 26% of good readers, while Park and Burri showed that poor muscle balance and faulty fusion are related to poor reading. Harris concluded that faulty fusion and poor eye muscle balance might be considered important handicaps to reading for some pupils.

Kephart reported that a group receiving visual skills training improved their educational standing 1.2 years, compared to 0.6 years for a similar group not receiving skills training.[2]

In other studies dealing with individual skills, Fendricks found that, on the average, poor readers have lower visual acuity, especially in the right eye.[4] Stump, in comparing stereopsis between best and fair students, showed and 11% to 50% advantage for the former.[6]

RESULTS:

In correlating total vision scores with above and below average reading scores, no significance correlations were found. The standard deviations of the vision, in the two groups, showed no significant difference, an "F" score of 1.47 being obtained.* Furthermore, the mean vision of the two reading groups showed no significant difference.**

Of the 100 students tested 66 subjects failed to obtain the visual standard of 95-100% (passing). Of the 66, 26 were below average readers, and 40 were either average or above average. This difference gave a chi square of 2.96 which is not significant.

Also, no significant difference in reading means was obtained in comparing passing with failing vision: and marginal with failing.

The writers found the only visual skill to correlate significantly with reading was fusion in the above average reading group: this gave a +0.34 correlation, significant at the 0.01 level.

There was a significant difference between the mean reading score of the passing vision and marginal vision categories, at the 0.01 level, a "t" score of 2.74 being obtained. (The necessary "t" must fall between 2.65 and 2.66 for a significance level of 0.01.)

*The distribution of "F" for 0.05 and 0.01 was obtained from a reprint of Snedicor, George W., *Statistical Methods*, Iowa State College Press, 4th Edition, 1946.
**"t" significance from Garrett, Henry E., op. cit. P. 464.

An analysis of the passing vision group showed seven below average readers passing and 27 as failing. The chi square of 11.6 makes this difference significant at the 0.01 level, since 6.635 is necessary.

From Table 1 the number of below average and above average readers passing two visual levels can be observed.

TABLE 1

Percentage of Above and Below Average Readers Passing and Failing Two Visual Levels

Reading Group	95-100% Visual Level	88-100% Visual Level
Above Average Readers	60% Fail	29% Fair
	40% Pass	71% Pass
Below Average Readers	79% Fail	38% Fail
	21% Pass	62% Pass

At the most stringent level (95-100%) the difference between the number passing and failing, in the above and below average reading groups, gave a chi square of 5.45 which is significant at the 0.02 level. This would mean that below average readers fail to meet the visual requirements more so than above average ones.

At the second level (88-100%) there is an insignificant chi square between those passing and failing in the two reading groups.

In comparing the relationship between the Keystone visual skills tests with intelligence, no significant difference in standard deviations between the I. Q. ranges of 90-110 and above 120 was found. However, the writers did find that the standard deviation of vision scores, between the I. Q.'s of 111-120 and above 120, were significantly different at the 0.01 level, a 2.68 "F" score being obtained. Also, a standard deviation in vision scores, between the I. Q. ranges of 111-120 and 90-110, was significantly different at the 0.05 level, the "F" score being 1.92.

TABLE 2

Distribution of the Means and Standard Deviations of Vision Scores in Three I. Q. Ranges

I. Q. Ranges	Number of Cases	Mean Vision Score	S. D.
90-110	33	85	13
111-120	27	86	18
Over 120	40	90	11

The authors conclude that the middle I. Q. range has a large spread of vision scores, while the other ranges are significantly smaller. Therefore, the tendency is for vision scores in the I. Q. groups of 90-110 and above 120 to be more homogeneous than the 111-120 groups. Atten-

tion is also drawn to the means of the groups. The highest mean vision score of 90 belongs to the highest I. Q. group.

In comparing the three visual categories, a "t" score of 2.26 between the means of the I. Q. in the passing and failing vision categories was obtained: significance at the 0.05 level requires a score of 2.0. This indicates that higher vision scores are associated with higher I. Q., since the passing category showed a mean I. Q. of 123.2, in comparison with 115.0 for the failing category (see Table 3).

TABLE 3

The Mean I. Q.s of Children in Three Visual Categories

Visual Categories	Number of Cases	Mean I. Q.
Passing	34	123.2
Marginal	33	116.0
Failing	33	115.0

In comparing the number of subjects passing and failing the visual level of 95-100%, within three I. Q. ranges, the tendency was for more cases to fail than pass (see Table 4). The I. Q. group of over 120 showed the least significant number of failures, the highest number being found in the 90-110 I. Q. group: in the latter group a chi square of 12.3 was the result, which was significant at the 0.01 level. From Table 4, it can be seen that, although the chi squares were not significant in all cases, there was an increase in the ratio of failures to those passing as the I. Q. decreased, showing a trend for more failures in the lower I. Q. groups.

The second visual level of 88-100% showed a tendency for more subjects to pass, rather than to fail. In this category, however, the greatest proportionate number of those passing was found in the highest I. Q. range, a chi square of 10 being obtained: this is significant at the 0.01 level. The proportionate number of those passing is least in the lowest I. Q. group. Again, although the chi squares are not statistically significant in all cases, there appears to be a decrease in the ratio of failures to those passing from the higher I. Q. range to the lower, indicating that relatively more children in the higher I. Q. group passed (see Table 4).

Thus, it may be said, that where the visual standards are high, the lowest I. Q. range shows a tendency for a relatively greater number of failures than passers. When the standards are lowered to include both the marginal, and passing visual categories (88-100%), the highest I. Q. group has the greatest number of children passing, in comparison to the number failing, than do the other I. Q. groups.

TABLE 4

The Relationship of the Number of Subjects Passing and Failing, Within Three I. Q. Groups, at Two Visual Levels

I. Q. Ranges	95-100% Vision Level I			88-100% Vision Level II		
	P	F	C	P	F	C
90-110	7	26	12.3	14	19	0.8
111-120	9	18	3.0	18	9	3.0
Over 120	18	22	0.4	30	10	10.0

Column P—Number of subjects passing.
Column F—Number of subjects failing.
Column C—Chi square of the difference between the number passing and the number failing.

In comparing the Keystone visual skills tests with both reading and intelligence, no significant correlations were uncovered between reading and total vision, in each of the three I. Q. ranges.

When the relationship between individual vision skills and reading achievement, within different I. Q. ranges, was considered, test 4 (far-point fusion) gave the only significant correlation of +0.43. This was for the I. Q. range above 120, and is significant at the 0.01 level.

In the I. Q. group of 90-110, 26 of the 33 children failed the passing vision level. Of these 26, 18 were below average readers, and 8 were either average or above average. This difference was found to be significant at the 0.05 level, with a chi square of 3.843.

It may be concluded, therefore, that when I. Q. was not considered, the 66 subjects who failed the passing vision range (as noted earlier) showed no significant tendency for being either below or above average readers. However, when the intelligence was considered above, the lower I. Q. group of 90-110 did show a significant difference. This group contained predominantly more below average readers who failed to meet the passing vision requirements.

DISCUSSION

The results showing the relationship of vision to reading achievement is important to educators. While this study was not concerned in determining whether an improvement of the visual skills will result in a corresponding increase in reading achievement, Kephart has shown this to be true.[2]

The writers found that the mean reading scores between passing and marginal vision were significantly different (see Table 5).

TABLE 5

Mean Reading Scores of Children in Three Visual Categories

Visual Category	Mean Reading Score
Passing	6.9
Marginal	5.8
Failing	6.2

It is interesting to speculate as to the effect on reading achievement in the middle vision group if corrective visual therapy were given. It is possible that the reading scores of this group (marginal) would be significantly increased as their visual level approached the passing category.

It will also be noted that the mean reading score of the failing vision category is higher than that of the marginal vision category. Although this difference is not significant, the writers conclude that a mild visual problem may interfere with reading achievement to a greater degree than a severe visual problem.

The fact that significant correlations for far point fusion were found in the upper I. Q. group, as well as in the above average reading group, might be expected. It is known that better readers tend to be found in the higher I. Q. groups. It is interesting to speculate, also, as to the effect of fusion training on I. Q.

The tendency for high I. Q. groups to be in the higher vision categories more often than lower I. Q. groups lends credence to the possible effect of visual skills training in I. Q. increase.

The writers feel that the visual categories utilized in this study cannot be used for diagnostic purposes. The score obtained should be used merely as a basis for referral and a broad index of the child's visual status.

SUMMARY AND CONCLUSIONS

This study was designed to determine the relationship between the Keystone visual skills tests with:

a) Reading
b) Intelligence
c) Reading and intelligence

A group of fifth and sixth grade students were classified into three I. Q. groups (90-110, 111-120, and over 120), and were further classified as to below and above average readers. They were then tested on the Keystone test, given vision scores in per cent, and categorized into one of three visual levels: passing, marginal, and failing. These areas were compared and the following conclusions were determined:

1. There is a tendency for above average readers to surpass below average readers in visual performance;

2. There is a tendency for high I. Q. groups to surpass low I. Q. groups in visual performance;

3. Far point fusion is associated positively with above average readers and high I. Q.

RECOMMENDED STUDIES

1. The Keystone test presents a broad impression of the child's visual skills. To determine, more accurately, the relationship of vision to reading achievement and I. Q., a complete visual analysis should be performed on the child, with fine instruments, so that minor distinctions can be determined.

2. The effect of visual skills training on I. Q. and reading achievement scores should be investigated.

3. Using the maturation age of the child as an index of his reading level, the writers found that only two of the 100 subjects tested were reading at the expected level* (maturation, or reading age, is determined by the formula M. A. equals I. Q. $\times$ C. A., where M. A. equals maturation age, I. Q. equals intelligence quotient, and C. A. equals chronological age). A recommended study, therefore, would be the comparison of vision to reading, where the maturation age is used as the reading score.

4. It would be interesting to follow up this study utilizing children of below 90 I. Q. The subjects could be classified as below and above average readers according to their maturation ages.

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*Although only two students were reading up to maturation level, 62% of the subjects were reading above grade level.

AN AUTOMATIC FOCUSING DEVICE FOR OPHTHALMIC LENSES*

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Recent developments in the electronic field have had wide application in nearly every phase of industry. High speed electronic computers are in daily use, not only for research and engineering tasks, but for such things as sales analyses and inventory control. Electronic control devices have made possible automatic or semi-automatic production lines enabling the manufacturer to produce better quality merchandise at lower costs. This paper deals with the application of electronics to a device for accurately and automatically determining the focal power of ophthalmic lenses. This instrument, developed by the American Optical Company about four years ago, makes possible the measurement of ophthalmic lenses to a power tolerance of less than 0.005 diopters on a fully automatic basis. Once the lens under test has been positioned in the instrument, the power is measured and automatically recorded on a chart, and, if desired, various areas of the lens can be scanned with an aperture to determine any variations in power which may exist over the lens area.

In order to understand the problems involved in the operation of the automatic focusing device, let us first look at the optical design of a regular lensometer. Figure 1 shows such a lensometer in cross

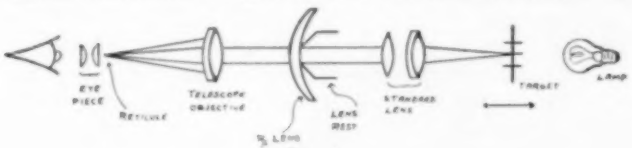

Fig. 1

section. When the power wheel is set at zero, the target is at the focal plane of the standard lens, such that when rays from the illuminated target pass through the standard lens, they emerge parallel. If the lens under test is plano, these parallel rays will enter the telescope, and since this telescope is focused for infinity, the eye will see an in-focus image

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of the target. If, however, the lens under test has power, then the rays emerging from this lens will no longer be parallel as they enter the telescope objective and so the eye will no longer see the target or will see it out of focus. In order to bring the image into focus under such a condition, the target is moved such that the rays emerging from the lens under test are again parallel. The amount by which the target has been moved is a measure of the power of the lens. It is essentially this same optical system which is used in the automatic focusing device.

In the case of the regular lensometer the light-receiving device which determines whether or not the image is in focus is the human eye. In order to obtain a device which is fully automatic and independent of an human operator, it is necessary to replace the eye with some other kind of light-receiving mechanism. In the automatic focusing device to be described, a photomultiplier tube and associated pinhole aperture are used to translate the optical image into electrical impulses.

There are several kinds of photoelectric devices which are in common use today. Perhaps the simplest of these is the photovoltaic cell which generates a small electric current proportional to the amount of light falling on it. If an ammeter is inserted in the circuit, the current flow can be measured, thereby giving an indication of the amount of light falling on the photo-sensitive surface.

The photovoltaic cell is not, however, a very sensitive device since the amount of current generated is small. In order to get increased sensitivity, a photoconductive cell can be used. Such a cell may employ a photo-sensitive material like selenium which increases its electrical

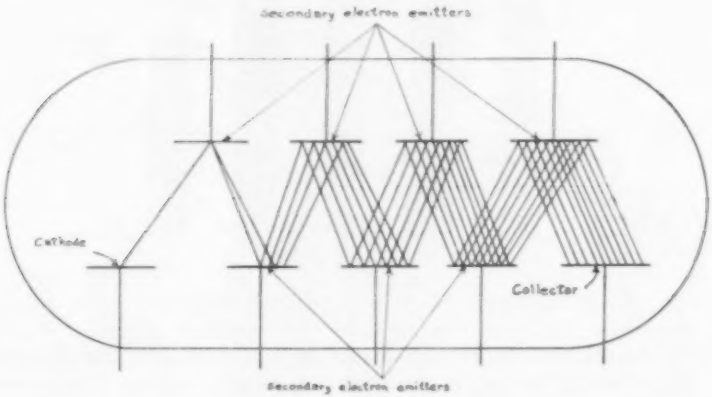

Fig. 2

conductivity in proportion to the amount of light falling on it. A more sensitive kind of photoconductive cell is made in the form of a vacuum tube, where light falling on the photo-sensitive surface of the cathode increases the electrical conductivity of the tube. The current which results can then be amplified in order to increase still further the sensitivity of the device.

In recent years an extremely sensitive photo tube has been developed called the photomultiplier, which is essentially a vacuum tube photoconductive cell with an unique built-in amplifier. Figure 2 shows a schematic diagram of a secondary-emission multiplier which is composed of a photocathode, a series of target electrodes or dynodes, and a collector. Light impinging on the photocathode causes a stream of electrons to migrate from the cathode to the first dynode. When these electrons strike the first dynode, they cause a larger number of secondary electrons to be emitted which are pulled to the second dynode. This effect cascades until a greatly increased number of electrons falls upon the collector.

A schematic diagram of the kind of photomultiplier used in the electronic focusing devise is shown in Figure 3. Here it can be seen

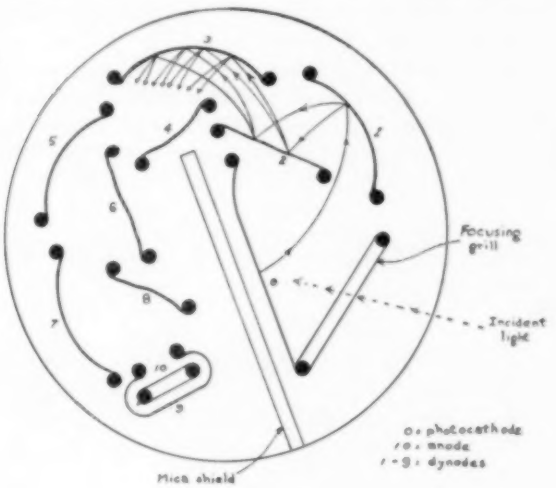

Fig. 3

that the dynodes have been so shaped as to always cause the electrons to be accurately focused on the successive dynodes so that a minimum of emission is lost. This system results in a tremendous increase in

sensitivity, such that a photomultiplier having nine dynodes, each having a yield of four (i.e., dynodes which emit four times as many electrons as impinged upon them), will have an output current which is more than 250,000 times as great as the current leaving the photocathode.

It is the development of these extremely sensitive photomultiplier tubes which has made the automatic focusing device possible, for the amount of light which is available at the photocathode is far too small to operate an ordinary photoelectric cell.

In relatively recent years, a new theory has been developed which relates the performance of an optical system to the response of an electronic circuit. If we consider for a moment an electronic amplifier, we know that the frequency response of this amplifier can be determined by passing through it sinusoidal signals of various frequencies and measuring the output with respect to the input. A sinusoidal signal is a perfectly pure tone. Such pure tones are seldom if ever encountered in music: the wave shape is usually far more complex. It can be shown that any periodic wave shape can be analyzed and will be found to be composed of sine waves of different frequencies harmonically related. In order to know, therefore, whether an amplifier will pass a signal of a given fundamental frequency and wave form, the amplifier can be tested by passing through it individually each of the various sine wave signals of which the wave form is composed.

An optical system can be tested in a similar manner. Figure 4

Fig. 4

shows a target consisting of a series of black bars with white spaces between them. If the transition between the black and white areas on this target is very abrupt, then an optical system would have to be nearly perfect in order to form an image with equally abrupt transition. Such a bar target can be shown by analysis to be made up of a series

of sine wave targets of high spatial frequencies.[1] In order to image such a target the lens system would also have to be capable of imaging these very closely spaced sine wave targets. We can, however, select a degree of sharpness which is satisfactory for the application at hand and then determine whether the lens system is capable of passing sufficiently high spatial frequencies in order to obtain this degree of sharpness. This is the fundamental principle upon which the automatic focusing device operates.

An electronic system is incapable of handling spatial frequencies but it can pass temporal frequencies. It is, therefore, necessary to convert the spatial frequencies present in the optical image into temporal frequencies, and this is done by mounting a tiny pinhole in front of the photomultiplier tube and then rapidly scanning the image. If the image is in focus at the plane of the pinhole, then light energy will be translated into current flow in the form of a square wave by the photomultiplier. Such a signal is shown in Figure 5a. If, however, the image of the bar target is not in focus, then the wave form of the current flow will no longer be square but will take the form of a modified trapezoid as shown in Figure 5b.

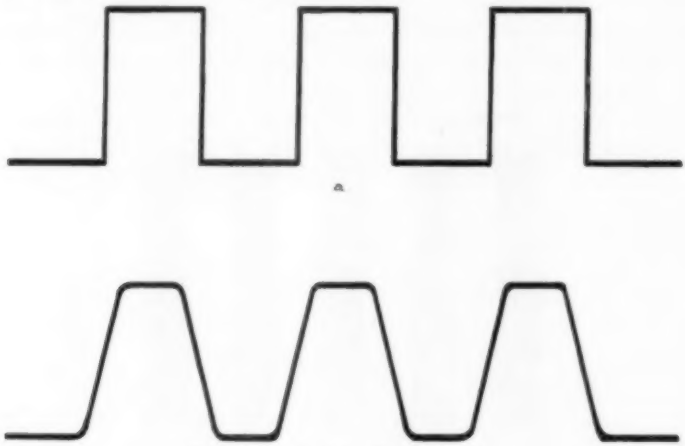

Fig. 5. Top, (a). Bottom, (b).

Figure 6 shows a schematic diagram of the optical system used in the automatic focusing device as well as a block diagram of the

[1]Spatial frequency in this context refers to a periodic function with respect to distance as opposed to the ordinarily conceived periodic function with respect to time. When the latter concept is referred to, the term temporal frequency is used.

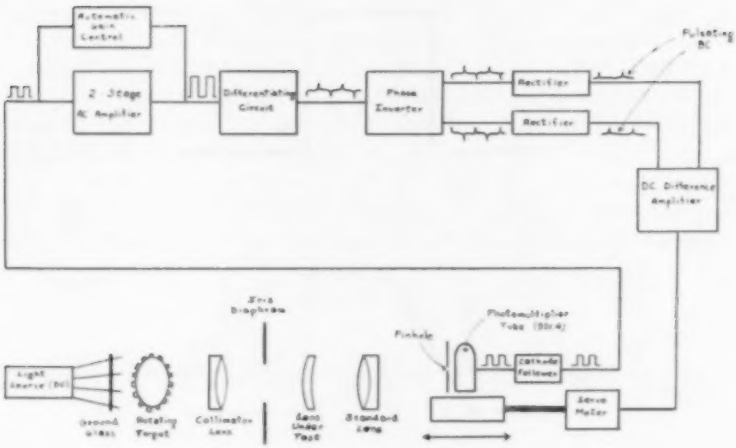

Fig. 6. Block diagram of automatic focusing machine.

electronic circuitry involved. A ground glass is illuminated by a light source operated on direct current. A rapidly rotating square-toothed target is located in front of the ground glass. This target is especially constructed such that the leading edges of the teeth are positioned about one-quarter inch in front of the trailing edges. A collimating lens is positioned such that the rotating target is at its focal plane: thus, light from the target emerges as parallel rays from the collimating lens. These light rays then pass through the lens under test and thence through a standard lens to form an image at the plane of a pinhole mounted directly in front of a photomultiplier tube.

As the target rotates, the images of the square teeth pass across the pinhole. Since the leading and trailing edges of the target are not in the same plane, they cannot both be in focus at the same time at the plane of the pinhole. When the pinhole and photomultiplier tube are moved out of focus in the direction of the standard lens, then the trailing edge of the rotating target will be more nearly in focus than the leading edge. If, on the other hand, the pinhole and photomultiplier tube are moved out of focus in the direction away from the standard lens, the leading edge of the rotating target will be more nearly in focus than the trailing edge. It follows that there will be a position where the leading and trailing edges are equally well in focus, and it is this position which the automatic focusing device searches out as the average focal plane of the leading and trailing edges.

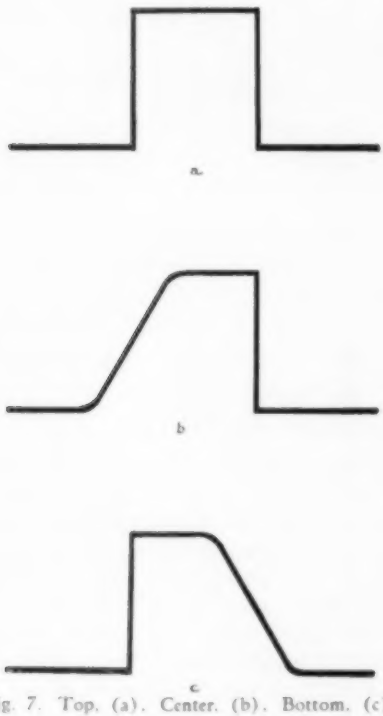

Fig. 7. Top, (a). Center, (b). Bottom, (c).

Figure 7a shows the wave form of the current flow from the photomultiplier tube in the in-focus condition. If the pinhole mounted in front of the photomultiplier is moved out of focus in the direction toward the standard lens, then the square wave will deteriorate into a modified trapezoid, where the trailing edge is steeper than the leading edge. This is shown in Figure 7b. Figure 7c shows the opposite condition where the pinhole is moved out of focus in the direction away from the standard lens.

Referring again to Figure 6, the current flow from the photomultiplier tube is sent through a cathode follower circuit which is a low impedence coupling device. This makes it possible to run a relatively long cable between the photomultiplier detector and the electronic section of the unit. The square wave signal then passes through a two-stage amplifier to increase the signal strength. An automatic gain control circuit across the two-stage amplifier maintains the height of the

square wave, after amplification, at a nearly constant value regardless of input amplitude. Thus the device is relatively insensitive to changes in the intensity of illumination at the pinhole which might result from voltage changes in the light source or absorption due to dirt on the lenses. It also makes possible the measurement of absorptive lenses without destroying the calibration of the instrument.

After amplification, the square wave signal is fed through a differentiating circuit which results in a signal having a wave form as shown in Figure 8. The positive peaks on this wave form represent

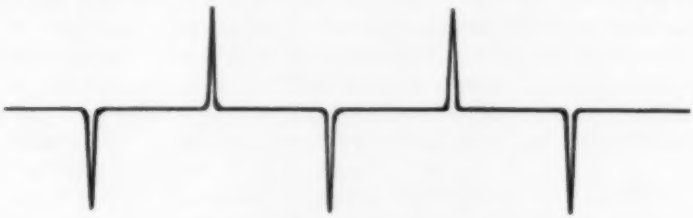

Fig. 8

the steepness of the rise of the square wave, while the negative peaks represent the steepness of the fall of the square wave. Thus, the more nearly in focus is the leading edge of the rotating target, the higher will be the negative pulses, while the more nearly in focus the trailing edge of the square wave target the greater will be the positive pulses.

The so-called differentiated signal is then fed through a phase inverter from which two signals emerge, one of them being the mirror image of the other. In Figure 6 the top signal coming out of the phase inverter is essentially the same as the one which entered, whereas the lower signal has been inverted. Now, the positive peaks of the top signal are a measure of the steepness of rise of the square wave, and the positive peaks of the lower are a measure of the steepness of fall of the square wave. We now need to deal only with the positive peaks and so both of these signals are fed through the rectifier circuits which clip off the negative peaks. The result is that we have two pulsating direct current signals which are then sent through a direct current difference amplifier. If the pinhole is located at the in-focus position, these two signals will be of equal magnitude, and since no difference exists between them, there will be zero signal coming out of the D. C. difference amplifier. If, on the other hand, the pinhole is at an out-of-focus position, then one of the signals will be greater than the other, and this difference signal is fed to drive a motor which moves the pinhole in the proper

direction to bring it into the in-focus position. Once the position is reached, the signals entering the D. C. difference amplifier are once more alike, and the motor stops. The direction the motor turns to bring the pinhole to the in-focus position is dependent upon which of the two pulsating D. C. currents entering the difference amplifier is the greater.

In actual operation, an automatic chart recorder has been connected to the back-and-forth motion of the pinhole and photomultiplier such that it automatically records its position and therefore the power of the lens under test. Provision has also been made for rotating the lens under test, and this rotation has been coupled with the chart drive on the recorder such that a continuous plot can be made of the meridional power of a lens as it rotates through 360°. If a slit or other aperature is mounted between the collimating lens and the lens under test, various areas of the lens can be scanned in order to search for zonal aberrations.

The instrument has been found to be extremely useful in the inspection and quality control of ophthalmic lenses. In addition, it has served a useful function in determining the effect of surface aberrations on the actual performance of ophthalmic lenses. It has also found application in the ophthalmic lens development field, since a great deal of information about the performance of a lens can be obtained quickly and accurately.

ANNOUNCEMENT

BOSTON MEETING OF OMEGA EPSILON PHI

The international optometric fraternity, Omega Epsilon Phi, will hold its annual convention Saturday and Sunday, December 13-14, 1958, at the Statler Hotel, Boston. This meeting will be held during the annual meeting of the American Academy of Optometry, December 10-16 at the same hotel, and fraternity members are invited to come to Boston on the 10, 11 and 12 of December to attend the post-graduate courses which will be given by the Academy at the Statler. Arrangements are being made for fraternity members to also take in many of the other special events put on by the Academy during this week.

FURTHER INVESTIGATION OF A QUALITATIVE AND QUANTITATIVE METHOD FOR SCREENING ANISEIKONIA*

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INTRODUCTION

The purpose of this study is to further the investigation of a qualitative and quantitative method for screening aniseikonia developed at the Columbia University School of Optometry by Cohen, Forman and Milan. The objective of this previous study was to fill the need for an accurate aniseikonia screening device, which would be readily accessible for general use by any practitioner, with respect to its economic and time consuming aspects.

A set of twenty-one stereo slides was made by photographing a model of the original space eikonometer target with a stereo camera. Differences in magnification were created in 0.50% steps up to 4.00% for axis 90 and axis 180, and in varying degrees of declination up to 0.86°. These slides were used in conjunction with a standard stereo viewer, and a screening procedure and recording technique were proposd. An intensive study was made involving three subjects in whom varying amounts of aniseikonia were induced. Measurements made with the screening device were compared to those obtained with the office model space eikonometer.

The results obtained show that for values between 0.00 and 4.00% magnification, axis 90° and 180° can be measured with the screening slides to within approximately 0.50% of the measurements obtained with the office model space eikonometer. For values up to 0.86° declination, the wide range of measurements obtained for the three subjects with both instruments allowed no definite conclusions to be drawn, although the trend of measurements for the office model space eikonometer and the screening device tended to be in the same general direction. Sensitivity measurements were found to be comparable for both instruments.

This study has been undertaken in an attempt to further determine

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and compare the measurements obtained with the aniseikonia screening device with those obtained with the space eikonometer on a large number of subjects, and to further substantiate the conclusions drawn by the previous investigation concerning the applicability of this instrument as a suitable screening device.

APPARATUS AND PROCEDURE

The apparatus employed in this study consisted of the stereo-realist viewer mounted on an adjustable pedestal, an instrument table with an adjustable head and chin rest, the set of twenty-one stereo slides and the office model space eikonometer, as described in the previous study.

The forty subjects used in this investigation were obtained from the student body of the Massachusetts College of Optometry and the staff and patients of the Optometric Center of New York.

The subject was comfortably seated before the instrument upon which measurements were to be obtained, and was carefully positioned with respect to eye level, head position and interpupillary distance. The method of bracketing was employed for obtaining measurements of aniseikonia on both instruments, through the subject's habitual prescription, together with a modified ABBA technique in which every other subject's measurements were first obtained with the office model space eikonometer, in order to minimize any practice or fatigue effects.

The presence of stereopsis was elicited from each subject before proceeding with each set of measurements. This was accomplished by securing the desired response from the subject while viewing the "normal" target in each instrument.

Each subject's readings were obtained in the following order: axis 90°, axis 180° and finally the declination. For each presentation of the eikonometer target or stereo slides the subject was forced to make a three category judgment as to whether either of the two front lines was further away or they were equidistant in the case of axis 90°, whether either side of the cross was away or were they equidistant in the case of axis 180°, and whether the top or bottom of the cross was further away or were they equidistant when determining the amount of declination.

Enough magnification was induced in the eikonometer or with the slides so that the subject could readily report a tilting of the target at the beginning of each series of judgments. Changes in magnification were made alternately before the right and left eyes in 0.50% steps in the case of axis 90° and axis 180° with both instruments, and in 0.02° of declination in the office model space eikonometer; changes in declination in the screening slides were dictated by the slides used. The alter-

nate presentations were varied so that the subject could not get "set" for any particular response. The subject's responses were recorded on the appropriate record form, based upon the screening procedure and recording technique proposed in the previous study, along with any other pertinent information which might be deemed necessary.

The rheostat in the stereo viewer was held fixed in order to pro-

TABLE I

Data obtained for each subject as measured on the screening slides and eikonometer for axis 90°, including modified slide findings as determined by the use of a 0.75 per cent correction factor. All values are per cent magnification.

Subject	Sex	Age	Slides	Eikonometer	Slides (0.75% Corr.)
R.B.	M	22	2.50L±1.00	0.75L±0.50	1.75L±1.00
I.G.	M	58	3.25L±0.50	3.00L±1.00	2.50L±0.50
C.S.	F	42	1.00L±0.50	0.50L±0.50	0.25L±0.50
J.M.	M	22	2.50L±0.50	1.75L±0.50	1.75L±0.50
G.Z.	M	25	1.75L±0.50	0.50L±0.50	1.00L±0.50
A.B.	M	47	1.00R±0.50	0.00 ±0.50	0.25R±0.50
K.S.	F	37	1.50L±0.50	0.00 ±0.50	0.75L±0.50
D.G.	M	43	1.75L±0.50	0.00 ±0.50	1.00L±0.50
M.B.	F	51	1.50L±1.00	0.00 ±0.50	0.75L±0.50
P.B.	M	56	1.50L±0.50	0.00 ±0.50	0.75L±0.50
A.E.	M	47	0.75R±0.50	0.00 ±0.50	0.00 ±0.50
F.G.	F	12	1.50R±0.50	0.50R±0.50	0.75R±0.50
J.B.	M	38	1.50L±0.50	1.00L±1.00	0.75L±0.50
H.C.	M	28	0.50L±0.50	0.50R±0.50	0.25R±0.50
J.P.	M	44	0.00 ±1.50	0.75R±0.75	0.75R±1.50
M.F.	M	27	1.00R±0.50	0.00 ±0.50	0.25R±0.50
J.W.	M	22	3.00L±1.50	3.00L±1.50	2.25L±1.50
R.M.	M	25	2.25L±0.50	1.50L±0.50	1.50L±0.50
E.F.	F	57	1.75L±0.50	0.50L±0.50	1.00L±0.50
C.S.	F	45	1.00R±0.50	0.50R±0.50	0.25R±0.50
R.M.	F	54	1.00L±0.50	0.50L±0.50	0.25L±0.50
H.D.	M	22	2.50R±1.50	1.50R±0.50	1.75R±1.50
B.L.	M	28	2.75R±0.75	3.00R±0.75	2.00R±0.75
J.N.	F	9	2.25L±0.50	1.00L±0.50	1.50L±0.50
S.G.	M	41	2.75L±0.50	0.50L±0.75	2.00L±0.50
P.D.	M	39	1.75L±0.50	0.00 ±0.50	1.00L±0.50
S.B.	F	47	0.75L±0.50	0.75L±0.50	0.00 ±0.50
R.S.	F	40	1.75L±0.75	0.50L±0.50	1.00L±0.50
B.K.	M	27	2.75L±0.50	1.50L±0.50	2.00L±0.50
J.F.	M	24	2.00R±0.50	1.00R±0.50	1.25R±0.50
U.T.	M	60	2.00L±0.50	0.00 ±0.50	1.25L±0.50
E.D.	M	29	2.00L±0.50	1.00L±0.50	1.25L±0.50
R.G.	M	27	2.25L±0.75	0.50L±0.75	1.50L±0.50
E.M.	M	26	1.00L±0.50	0.50R±0.50	0.25L±0.50
T.B.	M	19	2.50L±0.50	0.75L±0.75	1.75L±0.50
W.D.	M	25	2.00L±0.50	1.00L±0.75	1.25L±0.50
G.G.	F	19	2.00R±1.00	0.00 ±0.50	1.25R±1.00
M.M.	M	27	0.75L±0.75	0.50L±0.50	0.00 ±0.75
M.W.	M	23	1.00L±0.75	0.50R±0.50	0.25L±0.75
P.W.	M	25	2.75L±0.75	1.00L±0.50	2.00L±0.75
J.W.	M	22	2.50L±0.50	2.50L±0.75	1.75L±0.50
J.W.	M	22	3.00L±0.50	3.00L±0.75	2.25L±0.50
R.M.	M	25	1.25L±0.50	0.50L±0.50	0.50L±0.50
R.M.	M	25	1.75L±0.50	0.50L±0.50	1.00L±0.50

vide a constant level of illumination at all times. The office model space eikonometer required no adjustment in this regard, since the illumination level is a fixed one. The light was turned off in both instruments, however, between each magnification change, so as to keep the findings free from any possible residual aniseikonia effects. Room illumination was also maintained at a constant level for all measurements taken.

TABLE II

Data obtained for each subject as measured on the screening slides and eikonometer for axis 180°, including modified slide findings as determined by the use of a 0.75 per cent correction factor. All values are per cent magnification.

Subject	Sex	Age	Slides	Eikonometer	Slides (0.75% Corr.)
R.B.	M	22	0.75L±0.50	1.00L±0.50	0.00 ±0.50
I.G.	M	58	2.00L±0.50	2.00L±1.00	1.25L±0.50
C.S.	F	42	1.00R±0.50	1.00R±0.75	1.75R±0.50
J.M.	M	22	1.00L±0.50	1.00L±0.50	0.25L±0.50
G.Z.	M	25	0.25R±0.50	0.50R±0.75	1.00R±0.50
A.B.	M	47	0.50R±0.50	0.00 ±0.50	0.25L±0.50
K.S.	F	37	0.00 ±0.50	0.50L±0.50	0.75L±0.50
D.G.	M	43	0.50R±0.50	0.00 ±0.50	1.25R±0.50
M.B.	F	51	0.50L±1.50	0.00 ±0.50	0.25R±1.50
P.B.	M	56	0.75R±0.50	0.00 ±0.50	0.00 ±0.50
A.E.	M	47	0.50L±0.50	1.00L±0.50	1.25L±0.50
F.G.	F	12	1.00R±1.00	0.50R±0.50	0.25R±1.00
J.B.	M	38	2.25L±0.50	2.00L±1.00	1.50L±0.50
H.C.	M	28	1.00L±0.50	0.75L±0.50	0.25L±0.50
J.P.	M	47	0.00 ±1.00	0.00 ±0.50	0.75R±1.00
M.F.	M	27	1.00R±0.50	0.50R±0.50	0.25R±0.50
J.W.	M	22	0.50L±0.50	1.00L±0.75	0.25R±0.50
R.M.	M	25	1.50L±0.50	1.00L±0.50	0.75L±0.50
E.F.	F	57	1.25L±0.50	0.50L±0.50	0.50L±0.50
C.S.	F	45	1.75R±0.75	0.00 ±1.00	1.00R±0.75
R.M.	F	54	0.00 ±0.50	0.00 ±0.50	0.75R±0.50
H.D.	M	22	1.50R±1.50	0.50R±0.50	0.75R±1.50
B.L.	M	28	4.25R±0.50	3.00R±0.75	3.50R±0.50
J.N.	F	9	1.25L±0.50	0.50L±0.50	0.50L±0.50
S.G.	M	41	0.75L±0.50	0.50L±0.50	0.00 ±0.50
P.D.	M	39	1.25L±0.50	0.50L±0.50	0.50L±0.50
S.B.	F	47	0.25L±0.50	0.00 ±0.50	0.50R±0.50
R.S.	F	40	1.00L±0.50	1.00L±0.50	0.25L±0.50
B.K.	M	27	2.25L±0.50	1.00L±0.50	1.50L±0.50
J.F.	M	24	0.25R±0.50	0.00 ±0.50	0.50L±0.50
U.T.	M	60	1.00L±1.00	0.75L±0.50	0.25L±1.00
E.D.	M	29	1.50L±1.00	0.50L±0.50	0.75L±1.00
R.G.	M	27	1.25L±1.50	0.00 ±0.50	0.50L±1.50
E.M.	M	26	0.50L±0.50	0.50L±0.50	0.25R±0.50
T.B.	M	19	1.50L±0.50	0.00 ±0.50	0.75L±0.50
W.D.	M	25	1.50L±1.00	0.50L±0.50	0.75L±1.00
G.G.	F	19	0.00 ±1.50	1.00L±0.50	0.75L±1.50
M.M.	M	27	0.25R±1.00	0.50L±0.50	1.00R±1.00
P.W.	M	25	1.25L±1.00	0.75L±0.75	0.50L±1.00
J.W.	M	22	0.50L±0.50	0.50L±0.50	0.25R±0.50
J.W.	M	22	1.50L±0.50	0.75L±0.50	0.75L±0.50
R.M.	M	25	0.50L±0.50	0.50L±0.50	0.25R±0.50
R.M.	M	25	1.00L±0.50	0.50L±0.50	0.25L±0.50

RESULTS

The data obtained for each subject are shown in Tables I, II and III. These tables show for each subject the findings obtained on both the office model space eikonometer and the screening slides for axis 90°, axis 180° and the declination. Tables I and II also contain modified slide findings which were obtained through the use of a 0.75% correction factor subtracted from the original axis 90° slide measurements. Due to the construction of the slides any modifications made in the axis 90° measurements will effect the final axis 180° findings also, as shown in Table II, because of the necessary transposition in recording as explained in the previous study.

The means of the differences between the eikonometer and the screening slide findings, as calculated from the data in Tables I, II and III, are shown in Table IV. The coefficients of correlation, between findings obtained on the eikonometer and the screening slides, along with their significance are presented in Table V.

DISCUSSION

Examination of the data, as shown in Table IV, shows that there tends to be a mean difference in findings obtained with the two instruments of approximately 1.00% axis 90°, 0.50% axis 180°, and 0.14° of declination. In general, the findings obtained with the screening slides tend to show greater magnification for axis 90° and 180° than those obtained with the eikonometer. The coefficients of correlations, as presented in Table V, tend to show a fairly high degree of relationship between the measurements obtained with both instruments. The reliability of the coefficients of correlations, with relation to the number of subjects involved, was found to be significant in all cases at the 0.01 level.

Analysis of the data presented in Table VII, showing the measurement of the actual disparities present in the screening slides with a toolmakers microscope, reveals that the slides measuring magnification axis 90° have an actual disparity varying from 0.75 to 1.00% less than their presumed values. However, the slides measuring magnification axis 180° have an actual disparity much closer to their presumed values, varying no greater than 0.25% or less than 0.10% from these values.

A possible source of error, which may have contributed to this more or less constant difference between the actual slide disparities measuring magnification axis 90° and their presumed values, would be any difference in magnification between the twin lenses of the stereo camera used in photographing the space eikonometer target. Also to be consid-

TABLE III

Data obtained for each subject as measured on the screening slides and eikonometer for declination. All values are degrees of declination.

Subject	Sex	Age	Slides	Eikonometer
R.B.	M	22	—0.86±.30	—0.30±.30
I.G.	M	58	—0.86±.30	—0.30±.30
C.S.	F	42	+0.57±.50	+0.70±.35
J.M.	M	22	—0.57±.30	—0.70±.20
G.Z.	M	25	—0.57±.50	—0.50±.35
A.B.	M	47	0.00±.86	0.00±.35
K.S.	F	37	0.00±.86	—0.25±.25
D.G.	M	43	+0.14±.40	+0.20±.20
M.B.	F	51	0.00±.30	—0.15±.20
P.B.	M	56	—0.29±.30	—0.60±.20
A.E.	M	47	0.00±.86	0.00±.25
F.G.	F	12	+0.14±.15	+0.20±.25
J.B.	M	38	—0.29±.30	—0.40±.50
H.C.	M	28	+0.29±.30	+0.15±.20
J.P.	M	44	—0.14±.15	—0.25±.20
M.F.	M	27	—0.14±.15	—0.15±.20
J.W.	M	22	—0.35±.40	—0.30±.30
R.M.	M	25	0.00±.14	0.00±.30
E.F.	F	57	0.00±.86	0.00±.90
C.S.	F	45	+0.50±.40	+0.50±.50
R.M.	F	54	—0.14±.15	—0.20±.25
H.D.	M	22	—0.29±.60	—0.10±.25
B.L.	M	28	—0.29±.20	—0.30±.20
J.N.	F	9	0.00±.14	0.00±.25
S.G.	M	41	—0.57±.30	—0.20±.30
P.D.	M	39	—0.57±.30	0.00±.50
S.B.	F	47	—0.57±.30	—0.30±.25
R.S.	F	40	—0.57±.30	—0.70±.30
B.K.	M	27	0.00±.14	0.00±.25
J.F.	M	24	—0.86±.30	—0.90±.20
U.T.	M	60	+0.29±.60	+0.20±.30
E.D.	M	29	0.00±.86	0.00±.20
R.G.	M	27	0.00±.86	—0.10±.20
E.M.	M	26	0.00±.14	+0.10±.20
T.B.	M	19	—0.14±.40	0.00±.30
W.D.	M	25	0.00±.14	0.00±.30
G.G.	F	19	—0.57±.30	—0.30±.30
M.M.	M	27	0.00±.60	0.00±.30
M.W.	M	23	—0.29±.30	0.00±.20
P.W.	M	25	+0.29±.30	0.00±.30
J.W.	M	22	—0.57±.30	0.00±.25
J.W.	M	22	—0.29±.15	—0.25±.25
R.M.	M	25	0.00±.14	0.00±.20
R.M.	M	25	0.00±.14	+0.10±.20

ered as possible contributing sources of error, in relation to this constant difference, would be any variations from their presumed values in the size lenses, used to induce the magnification desired in photographing the target, and any inherent variations in the properties of the film employed together with the process used to develop and produce the slides.

Taking these factors into consideration, it was deemed necessary that a correction factor be employed in order to modify the axis 90°

TABLE IV

Means of differences between eikonometer and screening slide findings as calculated from the data in tables I, II, and III.

Axis 90°	Mean = 1.05%
Axis 180°	Mean = 0.54%
Declination	Mean = 0.14°
With 0.75% correction factor	
Axis 90°	Mean = 0.56%
Axis 180°	Mean = 0.53%
Declination	Mean = 0.14°

TABLE V

Coefficients of correlation between findings obtained on the eikonometer and screening slides.

Axis 90°	$r = +0.78$	Significant at 0.01 level
Axis 180°	$r = +0.83$	Significant at 0.01 level
Declination	$r = +0.82$	Significant at 0.01 level
With 0.75% correction factor		
Axis 90°	$r = +0.83$	Significant at 0.01 level
Axis 180°	$r = +0.82$	Significant at 0.01 level
Declination	$r = +0.82$	Significant at 0.01 level

slide findings. This correction factor would be subtracted from the original axis 90° findings to adjust for the constant error or difference found between the actual slide disparities and their presumed values. It was determined by a trial and error method, using different values, that a 0.75% correction factor would best modify the axis 90° finding, while having a minimum effect on the axis 180° findings. Employing the 0.75% correction factor, as shown in Table IV and V, reveals that there now tends to be a mean difference of approximately 0.50%, for both axis 90° and 180°, between the eikonometer and screening slide findings and approximately a +0.82 coefficient of correlation.

In general, the screening slide measurements of declination tended to compare favorably with those of the eikonometer showing a mean difference of 0.14° and a coefficient of correlation of +0.82.

The subjects seemed to show a greater degree of sensitivity to changes of declination in the eikonometer, possibly due to the ability to make more discrete changes with it than with the slides.

Examination of the data in Table VI reveals that in general the variation in findings from one measurement to another, on the same subject for both instruments, tends to be about the same, and that the repeatability of the measurements are similar.

Sensitivity measurements in general with both the eikonometer and the screening slides were found to be comparable, although it was found that a slightly greater sensitivity was present in making judgments with the eikonometer.

The bracketing technique used in this study is not necessarily the most desirable one available, but was used primarily due to its advan-

TABLE VI

Data obtained for subjects R.M. and J.W. as measured on three different days with the screening slides and eikonometer, for axis 90°, axis 180° and declination, including modified slide findings as determined by the use of a 0.75 per cent correction factor. All values are per cent magnification.

Axis 90°

Subject	Slides	Eikonometer	Slides (0.75% Corr.)
R.M.	2.25L±0.50	1.50L±0.50	1.50L±0.50
R.M.	1.25L±0.50	0.50L±0.50	0.50L±0.50
R.M.	1.75L±0.50	0.50L±0.50	1.00L±0.50
J.W.	3.00L±1.50	3.00L±1.50	2.25L±1.50
J.W.	2.50L±0.50	2.50L±0.75	1.75L±0.50
J.W.	3.00L±0.50	3.00L±0.75	2.25L±0.50

Axis 180°

Subject	Slides	Eikonometer	Slides (0.75% Corr.)
R.M.	1.50L±0.50	1.00L±0.50	0.75L±0.50
R.M.	0.50L±0.50	0.50L±0.50	0.25R±0.50
R.M.	1.00L±0.50	0.50L±0.50	0.25L±0.50
J.W.	0.50L±0.50	1.00L±0.75	0.25R±0.50
J.W.	0.50L±0.50	0.50L±0.50	0.25R±0.50
J.W.	1.50L±0.50	0.75L±0.50	0.75L±0.50

Declination

Subject	Slides	Eikonometer
R.M.	0.00±.14°	0.00±.30°
R.M.	0.00±.14°	0.00±.20°
R.M.	0.00±.14°	+0.10±.20°
J.W.	—0.35±.40°	—0.30±.30°
J.W.	—0.57±.30°	0.00±.25°
J.W.	—0.29±.15°	—0.25±.25°

TABLE VII

Data obtained through the measurement of the actual disparities present in the screening slides, with a toolmaker's microscope, as expressed in percent magnification.

Axis 90°

Slide Value	Actual Disparity
1.00%	0.20%
2.00%	1.15%
3.00%	2.25%
4.00%	3.00%

Axis 180°

Slide Value	Actual Disparity
1.00%	1.15%
2.00%	1.90%
3.00%	3.25%
4.00%	3.90%

tage of reducing the time consumed in securing measurements. It has been recommended that in measuring aniseikonia the "method of limits" be employed, and it is felt that this method might also be advantageous in this screening procedure. Due to the critical demands inherent in the measurement of aniseikonia, it would also be beneficial to obtain a number of measurements before coming to a definite conclusion regarding any particular patient.

The results of this investigation can not be compared directly to the results of the previous study, since the method of measurement employed in both studies differed. The previous investigation was also an intensive study involving three subjects, in whom varying amounts of aniseikonia were induced; rather than having a large number of subjects randomly selected and measured for any inherent amounts of aniseikonia present, as was done in this study. Nevertheless, the previous study did show that axis 90° and 180° could be measured with the screening slides to within approximately 0.50% of the measurements obtained with the office model space eikonometer, and the findings of this study show that, with the use of a correction factor, similar results have been obtained. The results found in this investigation are also more conclusive, concerning the reliability and validity of the declination findings, than those of the previous investigation. However, on the whole it was found that declination measurements are very variable and relatively small, especially in comparison to those measurements found in the horizontal and vertical meridians.

Variations in the results obtained, with the eikonometer and the screening slides, may in part be explained by magnification differences between the twin lenses in the stereo viewer, and various difficulties encountered by the subjects in making judgments. These difficulties may have resulted from the nature of the slide target itself, such as its color and the thickness and separation of its lines in comparison to that of the eikinometer target, plus the various asymmetries and distortions of the target resulting from incomplete or difficult fusion and or prismatic effects induced by the high dioptral power of the viewing lenses.

The average difference of approximately 0.50% between measurements obtained with the office model space eikonometer and the screening device should not interfere with the use of these slides as a qualitative and quantitative screening method, since these differences may fall within the day to day variability of any individual. The office model space eikonometer itself has been found to leave much to be desired as an aniseikonia measuring instrument so that the screening device, which is not a measuring instrument, having measurements which on the average fall to within 0.50% of those obtained with the eikonometer, would seem to be adequate for screening purposes.

Therefore, on the basis of the findings obtained in this investigation together with the results of the previous study, it is felt that these slides and procedures have definite value for use as a screening device for aniseikonia.

SUMMARY AND CONCLUSION

It has been pointed out that there exists today a great need for an accurate aniseikonia screening device. In the previous study, a set of twenty-one stereo slides was made by photographing a model of the original space eikonometer target with a stereo camera. Differences in magnification in the slides were created in 0.50% steps up to 4.00% for axis 90° and axis 180°, and in varying degrees of declination up to 0.86°. During this investigation these slides were used in conjunction with a standard stereo viewer, and the screening procedure and recording technique proposed in the previous study were employed. Measurements made with the screening device were compared to those obtained with the office model space eikonometer on a larger number of subjects.

Examination of the results show that:

1. For values between 0.00% and 4.00% magnification, axis 90° and 180° can be measured with the screening slides, through the use of a 0.75% correction factor applied to the axis 90° findings, on the average to within approximately 0.50% of the measurements obtained with the office model space eikonometer.
2. For values up to 0.86° of declination, the declination can be measured with the screening slides on the average to within approximately 0.14° of the measurements obtained with the office model space eikonometer.
3. Coefficients of correlation for all measurements were found to be approximately equal to +0.82, tending to show a fairly high degree of relationship between the measurements obtained on both instruments with the reliability of the correlation, in relation to the number of subjects involved, found to be significant in all cases at the 0.01 level.
4. Sensitivity measurements were comparable for both instruments.
5. The stereo slides used in conjunction with a standard stereo viewer seem to have a definite value for use as a suitable instrument for screening aniseikonia.

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ANNOUNCEMENT

POST-GRADUATE EDUCATION AT OHIO STATE IN MAY AND JUNE

May Conference

A two day educational program will be held in Columbus, Sunday and Monday, May 18th and 19th.

This program is sponsored jointly by The Ohio State University School of Optometry and the Ohio State Optometric Association.

It will feature lectures by members of the Staff of the School of Optometry on subjects of current importance in clinical optometry and by guest lecturers in allied fields.

The Sunday afternoon and evening program will be held at the Deshler Hilton Hotel and the Monday morning and afternoon program will be held at the Ohio Union Building on the Campus.

Optometrists from Ohio and neighboring states are invited to attend. Program details will be published later.

Summer Courses

The Summer post graduate courses will be given June 16th to June 20th. The four courses to be offered this year are:

Aniseikonia, Anisometropia and Other Refractive Problems
Contact Lenses
Optometric Techniques for Industry
Orthoptics

These courses are limited to ten optometrists each and will be filled in the order that the registrations are received. Optometrists from anywhere are invited to enroll. Certifications of completion will be issued by The Ohio State University to all optometrists enrolled in these courses.

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OPTOMETRY, OCULAR PATHOLOGY AND REFERRALS*

The American Academy of Optometry has, as one of its requirements for admission, the writing of 10 case reports. This requirement is made of practicing optometrists, and the applicant is asked to select the case reports from his office files. The Academy sets the manner in which the cases are to be written, but it requires no pattern in the selection of the types of cases used by the applicant. It is suggested by the Academy that the applicant divide his cases among refraction, visual training, contact lenses, subnormal vision or pathology and the choice of distribution of these categories is left entirely to the applicant.

*Read before the annual meeting of the American Academy of Optometry, Section on Pathology, Chicago, Illinois, December 8, 1957. For publication in the April, 1958, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

This procedure produces a wide variety of reasonably complete case studies from all sections of the United States, Canada and other parts of the world. Recently the Committee on Admittance set aside the reports of fifty optometrists (500 cases) who reported one or more cases in which pathology of some type was recognized in the routine ocular examination. In all, 93 reports were collected from this total.

It must be kept in mind that this report represents only a very small but widely scattered group of optometrists (50) and only a very few of their office cases. Of the 93 patients, 65 had ocular pathology while 28 demonstrated an ocular manifestation of general or systemic pathology.

Table 1

OCULAR PATHOLOGY	NUMBER OF CASES
Lid allergy	1
Ectropion with eczema	1
Congenital ptosis	1
Conjunctivitis (trauma)	1
Exophthalmos	1
Orbital tumor (metastatic)	1
Catarrhal ulcer	1
Keratoconus	2
Keratitis with pannus	1
Traumatic corneal distortion	1
Acute iritis	2
Coloboma of uveal tract	1
Cataracts	5
Fluid vitreous	3
Retrobulbar optic neuritis	4
Melano-sarcoma of choroid	4
Rupture of choroid	1
Chorioretinitis	3
Vascular retinal changes	5
Retinal burn	1
Retrolental fibroplasia	1
Retinitis pigmentosa	4
Diabetic retinopathy	5
Glaucoma (simplex)	14
Glaucoma (acute)	1
	65

Table 1 shows the type of pathology reported and demonstrates the following interesting points:

(a) Pathology of all segments of the eye is represented except that of the lachrymal system and the sclera.

(b) Glaucoma is reported three times as often as any other condition.

Table 2 shows the type of general or systemic pathology reported, and the following observations may be made:

Table 2

Ocular Manifestations of Systemic Pathology	*Number of Cases*
Foci of infections	3
Multiple sclerosis	2
Glioblastoma	1
Diabetes (refractive signs)	3
Myasthena gravis	1
Motor palsy (syphilis)	1
Motor palsy (tubercular)	1
Motor palsy (traumatic)	1
Tumor (chiasmal)	6
Tumor (intracranial)	5
Etiology unknown	4
	28

(a) A wide variety of pathology is represented.

(b) There is a high incidence of neoplasms which were recognized by the optometrists.

In 82 of the 93 cases the tentative optometric diagnosis was confirmed. In six cases this was not so, and either a second medical opinion had to be sought or the repeated insistence of the optometrist to the original medical consultant was necessary before the diagnosis was made. In five instances no referral was made since the patient had been discharged recently by his medical consultant as having a stationary or old pathological condition.

Table 3

Referred to:	Ophthalmologists	60
	General practitioners	22
	Surgeons	3
	E. N. T. clinic	1
	Neuropsychiatrists	1
	Dentists	1
Not Referred:	Old pathology	5
		93

Table 3 shows the type of medical practitioner to whom the patient was referred. It is noted that all but five of the 93 cases were referred for medical care. Further, it demonstrates that the optometrists (not selected for this study) included in this report, not only showed a knowledge of the category of the pathology but also were able to make a choice in the selection of the area of the medical field that would best serve the patient's interests.

This is a report by the Committee on Admittance of various observations on the relationships of optometry, ocular pathology and referrals. Although not shown by any of the tables, it is nevertheless significant that the 93 case reports indicate cooperation and good rapport

between optometric and medical practitioners in the following ways:

(a) Statements in the reports by optometrists.

(b) Statements in the reports quoted from medical sources.

(c) Many medical reports accompanying the case reports.

(d) Many hospital reports accompanying the case reports.

Since it was not necessary to include any cases in the category of pathology when submitting reports to the Academy, the existence of so many cases in a random sampling (almost one-fifth of all the cases), the following general conclusions may be reached:

(a) These 50 optometrists do, in the daily practice of optometry, recognize pathology.

(b) These optometrists do refer patients with suspected pathology.

(c) These optometrists were sufficiently proud of the service they offer their patients that they included many of these cases in their reports.

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BIBLIOGRAPHIC MATERIAL

Ninety-three cases on file with the Committee on Admittance, American Academy of Optometry.

ACADEMY EXHIBIT AND LUNCHEON AT A.O.A. CONGRESS

The American Academy of Optometry will hold its annual luncheon for members and guests at the Shoreham Hotel, Washington, D. C., during the annual Congress of the A.O.A., June 25. Dr. J. Fred Andreae, past-president of the Academy, will be in charge of the luncheon. The Academy and the Pennsylvania State College of Optometry will have a joint educational exhibit at the A.O.A. Congress. Dr. Lawrence Fitch, vice-president of the Academy, will be in charge of the exhibit. All Academy members are now urged to make plans to attend this meeting.

SPECIAL REPORT

CREDIT CONTROL IN A PROFESSIONAL PRACTICE*

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The ophthalmic professions are faced today with extreme competition for their patient's dollar. Most of this competition comes from outside the professions. Obviously, the future of the ophthalmic professions is dependent upon capturing and maintaining its fair share of this total sum.

The purpose of this paper is to present a systematic budget finance plan which will enable the patient to obtain the professional ophthalmic services needed for today's modern living, and the ophthalmic professions to receive a fair share of the American dollar. Various professional budget systems will be evaluated. The business aspects of professional budgeting will be discussed. The advantages of a good budget system will be illustrated by individual case histories.

A tested budget finance plan will be outlined in detail and illustrations of the mechanics of its operation will be presented.

The income of U. S. workers according to their occupations is shown in Table 1.

Table 1. Occupational breakdown and average income of U. S. workers.

	% of Total Employed	Average Annual Income	Weekly
Professional and executive groups	22%	$8,200	$158
Clerical and sales	20	4,980	96
Skilled and semi-skilled	33	4,830	93
Farmers and farm workers	8	2,860	55
Unskilled	17	2,840	55
	100%		

Statistical Abstract of the U. S., 1957

*Read before the annual meeting of the American Academy of Optometry, Chicago, Illinois, December 10, 1957. For publication in the April, 1958, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Vice-President and Director of Sales.

‡Optometrist. Fellow, American Academy of Optometry.

Table 2. Expenditures of average U. S. family with average weekly income—$80 after taxes.

	Weekly Per Family	Percent of Total
Food	$20	25%
Transportation	10	13
Clothing	9	11
Housing	9	11
Household furnishings	5	6
Recreation, reading, education	5	6
Tobacco, liquor	5	6
Medical care	4	5
Household operation	4	5
Gifts and contributions	4	4
Saving	3	4
Fuel, light, refrigeration	3	4
Personal care	2	2
Miscellaneous	1	1

Study of Consumer Expenditures, Income and Savings, Bureau of Labor Statistics, 1957.

Table 2 shows how the patient's dollars are being spent. These patients are buying appliances, radios, automobiles, tires, batteries, amusements, liquor, and tobacco—in addition to housing, food, insurance, etc. "How," one may ask, "can today's consumer afford such outlays for all of these products and services?" The answer is simple and obvious. All of these products—and many others—are available on budget payment plans designed to fit the consumer's convenience. Retailers are making it easy for the public to buy their products. Included in budget plans are even vacation trips and investments.

It is important to realize that every business is competing for that $80.00. Others are getting more than their share of it because they know how to get it and are not restricted by professional ethics. Can the optometric profession expect to grow and can optometrists expect to enjoy increased fees and income if they are unable to compete for practice volume which is available only through a workable budget system?

Following is a discussion of the feasibility of optometrists getting a larger share of this tremendous market through a budget finance plan for ophthalmic services, of some of the advantages and disadvantages of various finance systems, and of means, methods, and procedures by which such a plan may be put to work.

Assume that the patient has an income of $80.00 a week and spends a minimum of $75.00 a week for necessities. If we assume that an average total fee is $40.00, it is obvious that this fee would take all he could save in eight weeks before he would be able to purchase these services for cash. That $40.00 can be spent before getting to the

professional office for the replacement of a tire, a battery, a TV tube, or to pay for the illness of one of the youngsters or for any one of a host of other occurrances.

The professional man must ask himself these questions: "If I am not now offering a credit or a budget program for the convenience of my patients, am I limiting my services? Am I restricting my own family because of restricted income? Am I fair to those patients who want my professional services but cannot get them because of their inability to pay cash?" Putting payments for services on an easy paying budget plan is an established practice and brings certain benefits to a doctor's practice.

We are not suggesting, of course, that everyone who comes to an office should have the privilege of buying services or materials on a credit basis, but we do advocate that everyone who seeks eye care and who has a good credit rating should have the privilege of buying ophthalmic services and materials on a budget plan.

Some of the features of various finance plans that are available today may be summarized.

PLAN I

This is the type in which another office is the third party to the budget plan. The doctor does the financing. This third party does the mailing of collection efforts to all delinquent accounts. They charge the doctor a certain fee for their efforts. This is not a *bad* plan—but there are three minor disadvantages.

1. The work load in the doctor's office is slightly increased even though he is paying a fee for these services to someone else.
2. There is an added cost to the doctor when he uses the plan to effect collection.
3. Often the collection efforts are carried on at long-range, thus failing to impress the patient enough to cause him to pay.

PLAN II

This is the type in which a bank or finance company does the financing and payments are made directly to their office. There is one distinct advantage: the doctor gets his fee immediately. The disadvantages are:

1. The patient pays a finance fee or charge—and usually he is unhappy because of it.
2. Usually the doctor is not in control of collection efforts and methods.
3. If the patient refuses to pay, there is recourse to the doctor, forcing him to pay the balance himself.

4. If there is no recourse to the doctor when a patient refuses to pay, perhaps he can visualize the methods used to effect collection, in view of the fact that there is little or no value to repossessed prescription spectacles.

5. The greatest disadvantage of all is that payments are made outside of the doctor's office to the finance company or to the bank. In effect, the doctor is actually sending his patients away from his office!

By sending patients away, the optometrist is losing traffic in his office which is vitally important in building and maintaining a practice. He misses the opportunity to meet those who accompany his patients. He also misses those opportunities to correct minor complaints—to make an adjustment—to discuss their vision—to hear them say, "When this is paid up, I am bringing Johnnie in."

6. There is a loss of good will and prestige for the optometrist when he suggests that his patients go somewhere else to make payments. The average opening charge account for the ophthalmic office is $30.00. Consider the patient's attitude toward the doctor should he get the idea that the doctor can not afford to carry his $30.00 account and must turn it over to a bank or finance company. Of course, the doctor may have hundreds of these small accounts, which the patient does not take into consideration, since the patient is thinking about his own account only.

PLAN III

This is the type where a bank or finance company does the financing, and all the payments are made in the doctor's office. Only one disadvantage is apparent. The exchange of records: the reporting of charges and payments for each account, put an extra load on the doctor's office assistant. The one advantage, to mention it again, is that the doctor gets his fee immediately.

One can see from this outline that there is one glaring disadvantage of financing through a bank or finance company, regardless of where payments are made. That is the additional cost to the patient. Yet, the doctor gets no more from his patient.

Now note how this financing usually works: If there is an outstanding balance of $30.00, the usual service charge is 10%, or $3.00. This total amount is payable in three equal parts over a period of 90 days. If this were interpreted as percent of interest, what would that percent be? As shown in Table 3, it would be equal to a minimum of 40% per year.

Up until this time we have shown the need for a budget plan,

Table 3. Interest paid by consumers based on finance charges.

$30.00 - amount financed
$ 3.00 - Finance charge for 90 days
* * * * *
$3.00 is 10% of the total of $30.00
90 days is 1/4 of a year
10% × 4 quarters = 40% interest per annum

to compete for the patient's dollars, and have pointed out some of the disadvantages and advantages of several financing plans now being used. From this review it is evident that there is something yet to be desired in a budget plan for the doctor.

What is the answer? The answer is to have the doctor finance himself with controlled budgeting and charge his patients for the financing by increasing fees to all. Whether the patients avail themselves of the budget plan or not, all fees should be increased—by one, two or three dollars, or 10%, whichever is fair and reasonably competitive. After all, the average doctor feels that his fees and his income are not large enough, and if his patients will pay an extra $3.00 or 10% for carrying their accounts for 90 days through a bank or finance company, why not arrange to carry it right in his office? Why not enjoy that additional fee of one, two or three dollars which actually amounts to 40% interest?

Some doctors may feel that they can not afford such a plan since they do not have enough working capital. In that case they should discuss the possibility of a bank loan. Interest on the loan will amount to 6 or 7%. Credit can then be extended to the patients through a budget plan at a rate equal to 40% interest, by increasing fees 10%.

Is it fair to increase fees to everyone because some would be buying on a budget plan and some would not? The way many businesses operate in America today (and this aspect of professional life is strictly business), it is perfectly legitimate to set one price for all and allow all patients, "providing their credit is good," to make their payments on a budget plan over a 90 or 120 day period.

Let us look at a comparable example. Brown bought a suit at a certain store on the 5th of the month and paid $125.00 for it, in cash. Smith bought an identical suit at the same store at the same price, at the same time. He didn't have $125.00 in cash. However, upon receiving a statement at the end of the month, he will pay the $125.00 he owes.

Now Jones buys the identical suit for $125.00 at the same store, at the same time, but can not pay cash, nor can he pay for it at the end of the month. However, he can pay for it over a period of three months, paying one-third each month.

Now, the first man, who paid cash, received no consideration. He did not get a lower price for cash than the man who pays at the end of the month. The third buyer paid the same price and took three months to pay. This illustration indicates that our suggestion to increase fees to all and charge the same price to all, whether they budget or not, is common business practice and is not considered unfair or discriminatory.

It is strongly recommended that a raise of fees be put into effect with the introduction of any plan of this kind. Supposing that eventually the outstanding accounts will reach three or four thousand dollars. One could expect a reasonably good return on that amount if he had it in cash and properly invested. In this plan it is invested in one's patients and the doctor is certainly entitled to a return on his investment. At the same time he is rendering a broader service to his patients and making it easier for them to secure his services.

If he multiplies his total number of patients per year by the $3.00 increase referred to previously, he will readily see that this increase in income is substantial. The most important point to remember is, "If the patient's credit is good, he is deserving of credit."

Let's examine some of the advantages of a good budget plan:

1. More people will be able to secure visual services.
2. All patients can enjoy more complete visual services.
3. The doctor knows that every patient who needs it can secure the services at once.
4. The doctor can rightfully enjoy a higher fee from each of his patients because he is broadening his service to them.
5. By having a well-controlled budget, the doctor has a steady income. The insurance man who sells a policy this month collects for the next several years on the policy as the premiums are paid. The collections coming in on a good budget plan will eliminate the fluctuations of one's income (level off one's income), even when absent from his office.

The budget program that we are about to discuss has been tried and proved.

The first day it was in use in a pilot office, two patients secured more of his services because of it. The first one requested her outdoor sunglass correction be completed immediately. The second requested appointments for his two sons (who were under 12 years of age) whom he otherwise was going to neglect.

The plan we are discussing is called the "Professional Budget Finance Plan." A great deal of thought and exploration was used to arrive at this title.

1. "Professional" because it is designed for professional offices.
2. "Budget" because it implies paying regularly, weekly, semi-monthly, or monthly.
3. "Finance" to put a little teeth into it. In finance, contracts are far from foreign. It implies that it is handled on a business basis. The impact to the mind of the patient is in the doctor's favor.

The Professional Budget Finance Plan has several important forms to facilitate its operation.

1. The application for credit, which is also combined with the payment agreement.
2. The office record card.
3. The patient's record card.
4. The doctor's letterhead adapted to the plan.
5. The office sign displaying the fact that this plan is available.

We shall review these one at a time.

1. The credit application and payment agreement form is titled "Information for Professional Budget Finance Plan," as shown in Figure 1.

INFORMATION FOR PROFESSIONAL BUDGET FINANCE PLAN

Patient's Statement (If patient is a married woman show husband's full name and give information on both)

Patient's Full Name | Age | Name of Spouse | Age | No. Dependents

Address | How Long

Own or Rent Home | Phone | Last previous address

Employed By | How Long | Occupation

Maximum amount I (we) can pay each (week, semi-monthly, month) $ | How Long in City

Name and address of friend or relative in city

Bank References

Credit References

PROFESSIONAL BUDGET FINANCE PLAN — PAYMENT AGREEMENT

City ____ State ____ Date ____ 19____

For value received, I, we or either of us promise to pay to the order of X ____

____ Dollars ($ ____) in installments of $ ____ each on ____ of each ____ beginning ____ 19____, and a final installment of $ ____ due on ____, 19____.

In the event any one installment or any part thereof should not be paid when due, the entire balance due on this note shall, at the option of the holder hereof, become immediately due and payable, without notice. The parties hereto and the sureties and guarantors severally waive demand and presentment for payment, notice of protest and protest of this note, and further waive, insofar as they may legally do so, all rights of exemption of every kind under the laws of this or any other state, and in the event payment becomes delinquent and expenses be incurred in making collection, agree to pay such amount thereof as shall be allowed by a Court having jurisdiction.

Witness X ____

Fig. 1. Information for Professional Budget Finance Plan and Payment Agreement.

There are several important questions on this application which are significant because they are designed to help the doctor decide whether

credit should be extended to the patient. It goes without saying that if a patient does not qualify for credit, credit privileges should not be extended.

NOTE THE CIRCLED INFORMATION REQUESTED

Age . . . present address . . . how long at that address . . . own or rent . . . employed by . . . how long and credit references.

The lower half is the "Payment Agreement" and should be filled out by the assistant. Here it is indicated how the patient plans to pay for the service. Smaller payments will result in fewer delinquent accounts.

Notice this part of the last sentence: "In the event payment becomes delinquent and expenses be incurred in making collections, agree to pay such amount thereof as shall be allowed by a Court having jurisdiction." If the laws of the state allow the addition of attorney's fees or collection fees to the unpaid delinquent bill, they have agreed then to pay such fees.

The assistant should witness the signatures. The proper way to suggest that a patient sign the note is, "Mrs. Smith, would you put your approval here, please?" and point to the place where she should sign.

2. The office payment record card (Figure 2) is the record

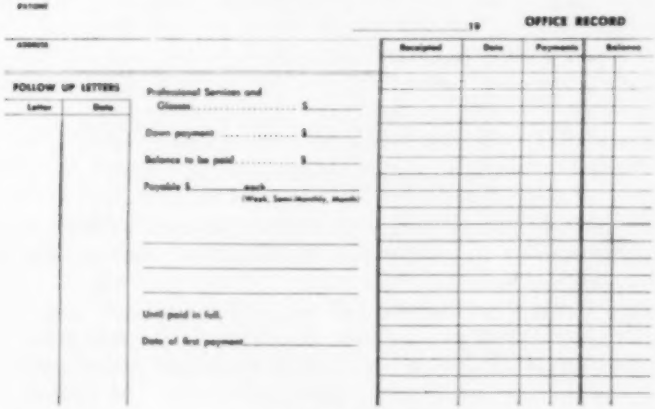


Fig. 2. Office Record.

of the outstanding account. (The patient's name should always be typewritten on this card.) It shows the total cost, the down payment and the balance to be paid and how the amount is to be paid (weekly, semi-monthly, or monthly). A space on the left of the card allows

room for recording any follow-up necessary for collection. All payments are recorded on the right side.

Fig. 3. Patient's Record of Payment.

3. Figure 3 is the patient's record of payment. On the top is the outside view of the card. It is always well to have the patient's name typewritten here.

Next is the title "Professional Budget Finance Plan" and below this the doctor's name is imprinted. The inside of the card is a duplicate of the office record card. This card shows the patient's balance, eliminating the need for monthly statements.

4. The last part of this plan utilizes the doctor's own letterhead as shown in Figure 4. In the upper left-hand corner, the name "Professional Budget Finance Plan" is imprinted in red. Then, should it become necessary to write a patient about her account, the office is immediately identified as a member of the Professional Budget Finance Plan. The office assistant should sign all correspondence relative to the

Fig. 4. Top of Letterhead, part only.

Professional Budget Finance Plan with only her initials and last name.

Now let us put the plan into action. The examination and refraction has been completed and the prescription determined. A suggested approach is as follows:

"Now, Mrs. Smith, your examination, your prescription, my services, together with your lenses, will be $35.00. If you would like a new frame you may select one and the total cost will then depend upon your choice of frames. In view of the findings of the examination and the facts pointed out in the history of your eyes, I am also prescribing for you a pair of outdoor lenses which will reduce the effect of excessive outdoor light. You will find that at the end of the day you will be much less tired, and of course there will be a minimum of squinting and therefore the squint lines, that often develop around the eyes, will not develop as rapidly. Those lenses will be only $15.00 because your examination fee is included in the original fee. Now, Mrs. Smith, so that I may instruct my secretary accordingly, how do you normally handle charges of this kind?" Hesitate slightly, then state, "Of course, you can make a partial cash payment at this time and with a satisfactory credit rating, if you wish, for the balance we can make arrangements with the Professional Budget Finance Plan right through this office—at no extra cost to you."

It is important to note what was said. What is going through the patient's mind. Her credit must be good. She has been impressed with the thought that the charge accounts are handled on a systematic businesslike basis; that a budget and finance plan is available to her, that it doesn't cost her any more and that she makes her payments right in the doctor's office.

If the patient now decides to take advantage of the Professional Budget Finance Plan, the doctor may say, "After you have selected your frame, Mrs. Smith, my assistant will make the necessary arrangements for the budget plan with you." The patient should then be escorted to the frame selection room. The budget arrangements are made when the frame selection is completed. The patient fills out the credit applications and the assistant fills out the balance of the form and the two record cards at her convenience and gives the patient's card to her when the prescription is delivered, instructing her to always present it with the payments.

We will not go into all of the details of the mechanics of handling the patient's record cards, but we will point out these two very important items:

1. The office record cards should always be filed in chronological order unless they become delinquent. File all delinquent account cards in alphabetical order.

2. A given day of the week is assigned to each delinquent notice, 1-2-3 and 4. Each day there is just a few minutes work to do.

Every day, at a glance, the doctor knows how many accounts are delinquent, and how many days they are delinquent, and how many notices they have had.

Let us assume that an account becomes delinquent. It is recommended that on the sixth day after becoming delinquent, the assistant telephone the patient. She may say, "This is Miss Brown calling for the Professional Budget Finance Plan of Dr. Jones. Our records indicate that your weekly payment was due last Thursday. This is very likely an oversight on your part, but we must know, inasmuch as your grace period will be up tomorrow. Will it be more convenient for you to come in today or tomorrow to make this payment, and keep your credit in good standing?"

Now you notice here the account is less than a week old and she is told that she is almost at the end of her grace period. Rather than asking whether she can come in to pay, she is asked whether she can come in today or tomorrow to pay. We can take a lesson, here, from a leading chain drug company. They increased their malted milk sales dollarwise by thousands of dollars a year, by getting all of their clerks to ask the simple question every time a malted milk was ordered, "Would you like one egg or two?" If they had said, "Would you like an egg?" naturally, in most cases the customer would have said "No," but they said, "Would you like one egg or two?" Their percentage of sales of one or more eggs in malteds went up immediately.

The reason for this is simply that the choice between two things will always get better results than the choice between one thing and nothing.

If the assistant should ask the patient whether she could come in tomorrow, and if the patient said, "No," the assistant would have very little chance of keeping that patient's account from really becoming delinquent, whereas, when she gives her a choice of coming in today or tomorrow, she eliminates the choice of coming in or not coming in.

If additional contacts are necessary, they can be made by mail or by telephone. If they are by mail, the assistant signs her initials and last name.

When a patient has an account which is delinquent and comes in to make her payment, it is well to review the method of payment with the patient. Consider the possibility of changing it to their advantage by reducing the payment or changing the payment date, so that the account does not become delinquent again.

There are a total of four notices or letters that are sent out at a spacing of six days apart. The last letter is sent by registered mail, return receipt requested.

If there has been no response whatsoever from the patient after four notices, it would seem to indicate that they do not intend to pay. Bear in mind that the last letter is sent by registered mail so that the doctor knows they have received it, and to impress upon the patient that this is an important legal obligation. A weekly payment account is never over 30 days delinquent with this system—she either pays, or the account is considered uncollectible. In which case proper disposition is made of this account. It has been proved, provided that this procedure has been carefully followed and only good credit risks selected, that very few accounts will fall into this category.

After a patient has completely paid up her bill, return the payment agreement and write a letter complimenting her on the payment of her account, suggesting she can use your office as a credit reference.

This may sound like too much additional work for the assistant. Be assured that it is not. The system is easy to maintain and actually takes less time than the time for reading this report. This program does not require monthly statements—just a little attention each day.

The professional budget finance plan is very effective in collecting old accounts, or putting old accounts on a regular payment basis. One doctor's office in four weeks' time brought his outstanding accounts from over $7,000 to $5,000 and from 279 to 175 accounts.

The professional budget finance plan is available and may be obtained as a complete system, or any of its parts can be purchased

separately.* The system includes: complete instructions, suggested sample letters, 500 of each of the forms, two indexes with signals, and a small sign for the office. Figure 5. The doctor's name should be imprinted on the patients' cards and the name "Professional Budget Finance Plan" imprinted on a small supply of his letterheads. The cost for this imprinting by a local printer is very nominal.

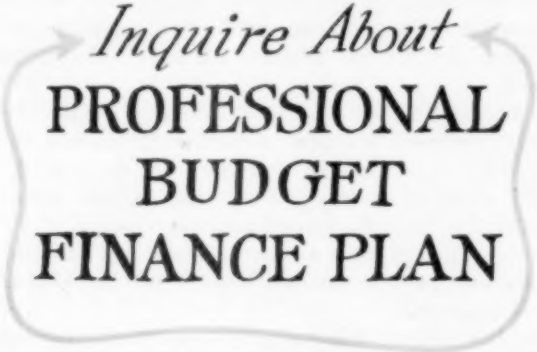


Fig. 5. Office Sign.

Let us discuss the cardinal points of this professional budget finance plan. They are all simple but if they are not adhered to, the whole program may fail, regardless of how complete it was when installed.

CARDINAL POINTS

1. Have a definite time in the course of handling each patient, where the fees and methods of payment are discussed, unless, of course, the patient mentions it first.

2. Every patient is a candidate for the professional budget finance plan. Yes, there is an occasional exception: the executive, the businessman, or the professional man whom the doctor knows pays his bills at the end of each month. However, in every practice that group is very limited.

3. Acquire adequate information by which the office can make a decision as to whether or not to allow credit.

4. The transaction must be kept on a courteous and businesslike, but friendly, basis. This is a business transaction which should be carried on in a businesslike manner.

*Inquiries should be addressed to Mr. Marshall S. Olson, Vice-President, Benson Optical Company, Medical Arts Building, Minneapolis 2, Minnesota.

5. It is best to keep the payments small even though it extends the time of the contract.

6. The office must have the patient's signature on the agreement form and have a witness to that signature.

7. The patient's name must be typewritten on their payment card and on the office record cards.

8. The procedure must not be neglected. It should not be put on a high business plane and courteous level this week and be slipshod next week.

9. The "get tough" policy must be used on delinquents when necessary. The program is set up so that this is a very simple procedure, not only to know who the delinquents are, but to follow through on collecting from them.

10. The efforts of the assistant must be backed up in every way by the doctor.

CONCLUSION

There is a tremendous demand for the consumer dollar, causing too many people to put off needed eye care services. A great many people today are interested and thoroughly accustomed to time payments. If they can be shown how it could fit into their budget, many more patients would enjoy eye care regularly.

Various budget plans can be adopted which would:

1. Enable many more people to get the eye care they need, and
2. The doctor to enjoy a larger yearly return from his practice.

The doctor could work through a finance company or bank:

1. This has the advantage of getting his fee immediately;
2. On the other hand, he may lose that patient contact so important to continuance of a successful practice.
3. He also loses the increased fee the patient pays as carrying charges.
4. Often he is embarrassed because of the collection methods used.
5. He actually has to guarantee the bank or finance agency that if uncollectable, he will assume the loss.
6. These plans increase the work load in his office.

To improve on the foregoing it is suggested that the doctor put into operation his own budget plan known as the "Professional Budget Finance Plan" and receive the additional income this plan will produce.

Management of one's own budget plan has many advantages, such as:

1. Increased practice because of the availability of credit.
2. Higher fees per patient.

3. A levelling off of the income.
4. Better patient contact and relations.

There is also a considerable personal satisfaction in having a well organized plan of credit control in a professional practice.

"Credit is here to stay . . . learn to practice with it!"

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

REPORT ON BOARD ACTIONS OF A.A.A.S.

This will serve as a report to the American Academy of Optometry on my activities as the Academy representative on the Council of the American Association for the Advancement of Science.

In my short period on this assignment I have had several opportunities to participate in the business of council, voting on officers, a dues raise, constitutional amendments, and other routine affairs by mail. I also had an opportunity to express an opinion on a proposed Junior Science Library list and to extend this privilege to several others of my choosing.

During the Indianapolis meeting of the A.A.A.S., December 26 to 30, 1957, I attended both Council meetings and several scientific sessions. Prior to the meeting I wrote a brief release in the HOOSIER OTOMETRIST urging all optometrists to attend, and in addition urged all optometry students at Indiana University to attend. I do not know how many responded, but we had the representation of several members of the optometry faculty in attendance at several of the scientific sessions. Actually, very few of the papers dealt with visual problems, so that the attraction was not great in this respect. I believe that papers on vision have been more plentiful at previous meetings.

You will be pleased to learn that the Academy actually has two members on the A.A.A.S. Council, the other being Sylvester Guth, representing the Illuminating Engineering Society. Incidently, I might mention also that the immediate past president, Dr. Laurence Snyder, and the new president, Dr. Wallace Brode, are both very well acquainted with optometric education and research.

The Council meetings were lively and inspiring. The influence of the launching of Sputnik I and II on the atmosphere of the meeting

was continuously apparent. I acquired the feeling that science and scientists may once again assume their proper role in the American scene. Several resolutions called for greater support of basic research, and indeed one may even result in a major conference or "parliament of scientists" to review and weigh the role of science in today's society. Another resolution of more specific interest to optometry would encourage a more widespread use of the metric system in weights and measurements. The next annual meeting of the A.A.A.S. will be in Washington, D. C., December 26-30, 1958.

HENRY W. HOFSTETTER, O.D., PH.D.

DIVISION OF OPTOMETRY
INDIANA UNIVERSITY
BLOOMINGTON, INDIANA

ACADEMY PROGRAM AS A SHOWCASE FOR OPTOMETRY

All professions have an annual gathering at which time progress that has been made is reviewed and evaluated. The annual meeting of the American Academy of Optometry serves each year in the capacity of bringing together the results of research programs in our various colleges as well as individual clinical contributions by men in practice.

Each December schools and colleges have been most generous in encouraging many of their key men to attend the annual meeting. This policy, of course, works both ways. The men in attendance come back to their schools with new ideas for research, plus better ways of accomplishing their present teaching programs. The Academy also serves as a showcase for the projects being carried on in the individual schools. Professional men have very limited means of advertising. Professional schools likewise have limited advertising possibilities. One of the best advertisements of a college, aside from its graduates, is the quality of its research program. A chance to display the results of these programs at a meeting such as the Academy is a valuable professional relations program for the institution and it enriches the literature.

It has also been most encouraging in recent years to note the number of papers presented by men in practice. There is a natural reluctance on the part of some men in private practice to appear upon the same platform with outstanding research leaders in the profession. This is understandable, as very few practitioners have the opportunity to address groups daily as do faculty members. There are certain types of contributions which men in practice can and must make. Papers are needed in the field of economics. New systems of record keeping, practice aids, fee schedules, and examination techniques and

record forms can best be evaluated by the men who are actually using them in everyday practice. While papers of this type may not come under the classification of a scientific paper, it is felt by most members of the Academy that they have an important place on our program when properly prepared.

Your Papers and Program Committee is encouraging men in practice as well as faculty members to actively participate in the annual meeting. Original ideas which have been found to work in one practice almost always have some practical application in another practice.

The Academy is encouraging the presentation of ideas in the field of basic research, economics, refraction, optometric specialities, or unusual case reports. This is a type of showcase which can prove of great value to the optometrist in attendance if he will but shop around a bit for these new ideas.

The annual call for papers will soon be sent to all of the fellows of the Academy. Boston is known as one of the finer educational centers of the world. During the week of the post-graduate courses and annual program in Boston, December 10-16, 1958, we feel that optometry is showing off its very finest in education. The participation of the individual member in the program, either in the sections or the general meeting, is encouraged.

RALPH E. WICK, O.D.

810 MOUNT VIEW
RAPID CITY, SOUTH DAKOTA

FORUM ON VISUAL AND READING PROBLEMS OF CHILDREN

The joint approach in caring for needs of children, was the theme of the 11th Annual Forum on Visual Problems of Children, Cleveland, March 7, 8 and 9. The 11th Annual Reading Conference was held simultaneously.

Sponsors of the meetings were the American Optometric Association, the Ohio State Optometric Association, the Northeastern Ohio Chapter, American Academy of Optometry, and the Ohio Council, International Reading Association. More than 150 optometrists from ten states and more than a thousand teachers from the Cleveland area attended. Dr. Lois B. Bing, Shaker Heights, Ohio, was program chairman.

Most of the talks and panel sessions dealt with reading problems. Speakers emphasized the importance of team work and need for better communication among the many specialists who have a responsibility

to help the child with a reading problem. The keynote was set by Robert J. Havighurst, Ph.D., professor of education, University of Chicago, who showed the complexity of factors affecting child development, and the fallacy of assuming that there is any panacea available from any specialist. His talk was followed by a series of presentations on education, emotion, intelligence, speech and hearing. The speakers were Helen Evans, Beachwood Public Schools; Wilda Rosebrook, Ohio State University; Ray Horne, Ohio Department of Education; and John Montgomery, Kent State University. Dr. H. Ward Ewalt, Jr., Pittsburgh, presided.

Dr. Neal J. Bailey, Division of Optometry, University of Indiana, in a talk on "Examination of the Pre-School Child's Vision," emphasized the need for more research on visual problems of children. He particularly cautioned against accepting claims for myopia control without evidence on failures as well as successes. Dr. Bailey outlined detailed procedures in examining the pre-school child.

The holistic approach to the developing child by Dr. Darell Boyd Harmon, Austin, Texas, was well received by educators and optometrists at a session Friday evening. His topic was: "Visual Perception: Factors Affecting It." Martha Gesling Weber, Ph.D., faculty, Bowling Green University, presided at this session. She is president of the Ohio Council, International Reading Association.

Dr. Don A. Frantz, DeKalb, Illinois, gave two lectures, "Successful Handling of Children from Birth Through College" and "Practice Management Aspects of Working Effectively with Children." While the talks were designed for practicing optometrists, many teachers also attended these sessions.

At the Saturday Reading Conference, primarily for teachers, the speaker was A. Sterl Artley, Ph.D., School of Education, University of Missouri, who spoke on "Upgrading Reading Skills at the Elementary Level." He stressed motivation and the use of many rather than any one system of teaching reading. He said that no teacher should rely solely on either the visual or phonic approach, and that all teachers should consider reading instruction as a part of their responsibility, regardless of subject matter being taught.

V. J. Ellerbrook, Ph.D., School of Optometry, Ohio State University, presided, and Rebecca P. Pedersen, Ph.D., acting head, School Division, Reading Improvement Service, Western Reserve University, led a discussion period following Dr. Artley's talk.

Helen Holt, Ph.D., faculty Toledo University, spoke on what teachers expect from the vision specialist, and Dr. Ruth P. Morris,

Toledo, discussed the same subject from the viewpoint of the optometrist. Both emphasized the growing acceptance of more comprehensive screening methods, beyond the Snellen chart, and functional vision care.

In "Upgrading Reading Skills at the Secondary Level," Marvin Glock, Ph.D., faculty, Cornell University, showed how reading is basic to the technical subjects on which there is now renewed emphasis. H. Charles, Ph.D., director, Reading Center, John Carroll University, led a discussion period on problems at the secondary level.

The practical aspects of the joint approach was well demonstrated in a panel session on "Special Services," moderated by Evelyn K. Davidson, Kent State University. The speakers were: Curriculum —Russell Slater, Columbus Public Schools; Clinical Services—George Slinger, Bowling Green University; Reading Consultant — Mable Vance, Findlay Public Schools; Optometrist—Dr. Ewalt.

A fellowship dinner was held Saturday night, with Dr. Hoyt S. Purvis, Jonesboro, Arkansas, A.O.A. president-elect, presiding, and Rev. Laurence Hall, East Cleveland, as the speaker.

Morning and afternoon sessions on Sunday were for optometrists. Dr. Alfred L. Klein, Spirit Lake, Iowa, described a vision screening program for pre-school children in Iowa. He urged optometrists to expand their activities into this field, which is relatively neglected.

Dr. Daniel Woolf, New York City, outlined a forthcoming manual on "Vision Care of the Partially Seeing Child." He said that an important objective is to help the child become a member of a group of his peers, rather than to be considered "exceptional." He said that the optometrist working with the partially seeing child must play a team role with many other specialists. Evelyn Eisnaugle, Columbus, Ohio, said that there was great need for improved communication among specialists. She said that the partially seeing child is often handicapped in other ways also, and no problem, such as vision, can be isolated and treated without consideration of other needs.

The Sunday afternoon session was devoted to functional vision and visual training, with Dr. Leo Manas, Illinois College of Optometry, Chicago, as speaker. He said that visual training should be offered by every optometrist and reviewed techniques.

CURRENT COMMENTS

Terry Judith Parkins
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

EXHIBITORS AT A.O.A. CONGRESS IN WASHINGTON

Twenty-six commercial optical exhibits will be seen at the annual meeting of the American Optometric Association at the Shoreham in Washington, D. C. The meeting will be held June 25-28, 1958. The following firms will exhibit:

American Optical Company
Southbridge, Massachusetts

Armorlite Lens Company
Pasadena, California

Art-Craft Optical Company
Rochester 6, New York

Bausch & Lomb Optical Company
Rochester, New York

Continental Optical Company
Indianapolis, Indiana

Garvin's Incorporated
Daytona Beach, Florida

Hudson Optical Corporation
Long Island City, New York

Kelley & Hueber
Philadelphia 4, Pennsylvania

Kono Manufacturing Company
Naval Base, South Carolina

Liberty Optical Manufacturing Company
Newark 2, New Jersey

Marine Optical Manufacturing Company
Boston, Massachusetts

Modern Optics, Inc.
Houston, Texas

C. V. Mosby Company
St. Louis, Missouri

The Opticase Company
Newark 7, New Jersey

Plastic Contact Lens Company
Chicago 2, Illinois

Rochester Optical Manufacturing
Rochester 4, New York

Sherman Specialty Company
New York 1, New York

Shuron Optical Company, Inc.
Geneva, New York

Styl-Optics, Inc.
New York 1, New York

Titmus Optical Company
Petersburg, Virginia

Tura, Inc.
Great Neck, L. I., New York

Univis Lens Company
Westbury, L. I., New York

Victory Optical Manufacturing Company
Newark 5, New Jersey

Vision-Ease Corporation
St. Cloud, Minnesota

Zylite Products Company
New York 10, New York

Zylo-Ware Corporation
Long Island City, New York

REFRACTIVE PROGRAM FOR THE INDIGENT

Dr. Alden N. Haffner announces that New Eyes For the Needy, Short Hills, New Jersey, a philanthropic foundation, has undertaken to support the social welfare program which has been under way at the Center for more than a year. Patients in need are referred to the Optometric Center by various social welfare and social service agencies certifying as to the indigency of the patient. The Optometric Center provides for the complete care of the patient including the dispensing of the correction. New Eyes For the Needy now will aid the Optometric Center in this worthy work by providing funds for the corrections.

SECOND SOUTHWESTERN CONTACT LENS CONGRESS

The Contact Lens Section of the Texas Optometric Association will hold its second contact lens congress, June 7-9 at the Hotel Roosevelt, Waco. Optometrists are invited to attend this three-day course of post-graduate instruction. The courses will include both basic and advanced training and will be given by Dr. John C. Neill, director of the contact lens clinic, Pennsylvania State College of Optometry, Philadelphia. Registration forms may be had by writing Southwestern Contact Lens Congress, P.O. Box 1602, Waco, Texas.

SCHOLARSHIPS AT UNIVERSITY OF HOUSTON

Four $200 scholarships have been given the College of Optometry, University of Houston, by the Foundation for Education and Research in Vision, Inc., of Austin. The scholarships are to be awarded for the fall semester of 1958. Any qualified optometric major may apply for one of the scholarships. In donating the scholarships, the F.E.R.V. hopes to interest more students in optometry. The F.E.R.V. is a non-profit organization chartered by the State of Texas and sponsored by the Texas Optometric Association.

NEWS FROM SUPPLIERS

Geneva, N. Y. The purchase of the assets and business of Shuron Optical Company by a wholly-owned subsidiary of Philadelphia and Reading Corporation has been announced, following the approval of the transaction by Shuron's stockholders.

Howard A. Newman, Philadelphia and Reading Corporation president, said that assets of the optical company which manufactures quality spectacle frames, lenses, cases and optical machinery, had been purchased for approximately $4,500,000 in cash. Earnings of Shuron over the past several years, he added, have averaged approximately $500,000 on a sales volume of $15,000,000.

The purchase of Shuron—third largest optical manufacturer in a field of some 100 companies—represents the third major acquisition by Philadelphia and Reading Corporation since the present management took office some two years ago. The other industries are, the Union Underwear Company, manufacturer of Fruit of the Loom, Derby and other leading brands underwear, and the Acme Boot Company, manufacturer of leather boots. Both companies achieved significant increases in sales volume and earnings during the last two years. Acme's profits have doubled and its productive capacity has trebled since its acquisition by Philadelphia and Reading.

"The financial resources of Philadelphia and Reading Corporation," Mr. Newman said recently, "will help Shuron Optical in carrying out its plans for further developing sales volume and increasing

its earning power."

Mr. Newman expressed gratification that Donald F. Southgate, president, as well as other officers of Suron, will continue to manage operations in the Geneva and Rochester plants. He emphasized that the high quality of Shuron's product, as well as the company's existing service, will be fully maintained.

Buffalo, N. Y. American Optical Company announces the transfer of its machinery sales and production departments from Southbridge, Massachusetts to Buffalo where it becomes a part of the Instrument Division.

Rochester, N. Y. The base curves for the Bausch & Lomb Panoptic trifocal lenses have been extended to —4.50 D. to +9.50 D. combined with a variety of cylinder powers. Their Orthogon industrial lens range has been extended to include sphero-cylinder compounds through ±4.00 D. sph. ⊂ +2.00 D. cyl. All lens thickness is proper for prescriptions with a 3 mm. minimum thickness.

NEWS BRIEFS

The Better Vision Institute is now distributing three new motion picture shorts for use by local TV stations. These films point up the need for eye examinations and the beauty of present day eyewear. . . . Additions to their frame lines are announced by Kono, Marine, American Optical, and Rochester Optical. . . . "Fickle Focus" is the central theme of a new series of newspaper ads now running in the midwest by the Upper Midwest Council for Better Vision. These ads stress "periodic professional eye examinations" and are tops. . . . The Plastic Contact Lens Company, Chicago, will offer courses in Canada during July and August. . . . Dr. Alfred A. Rosenbloom, dean, Illinois College of Optometry, was one of the speakers at the annual convention of the Illinois Association of Workers for the Blind in Chicago, March 21-22. . . . Dr. Marshall V. Mark, Boston optometrist, has been appointed head of the orthoptics clinic, Boston Dispensary, New England Medical Center, Boston. He succeeds Dr. William Smith, who has moved to California. Both men are members of the Academy. . . . The Optometric Center of New York held a symposium on geriatrics on March 30. . . . The Cincinnati Chapter of the Academy will have a program devoted to headaches on May 13, and one devoted to strabismus on June 10. . . . The third Eastern Seaboard Visual Training Conference will be held on May 21 at the Shoreham Hotel, Washington, D.C. Dr. Robert A. Kraskin, 900 F Street, Washington, is in charge of the arrangements. On the following day, May 22, also at the Shoreham, the D.C., annual Optometric Extension Program Congress will be held. Dr. A. M. Skeffington will be the speaker.

CLAY MAKES ACADEMY GIFT OF BARRAQUER FILM

Dr. Jay M. Enoch, Pathology Section, American Academy of Optometry reports that Dr. G. W. Clay of Ardmore, Oklahoma, has made a most generous contribution to the American Academy of Optometry. He has donated a print of Dr. Jose Barraquer's film on corneal transplantation. This film was one of those brought by Dr. Hernando Henao of Bogata, Columbia, to the Academy meetings at Chicago last December. Readers who were present at the meetings of the Pathology Section will remember the extremely interesting film also prepared by Dr. Barraquer on anterior chamber lens inserts. It is our hope to again display the film contributed by Dr. Clay at the Pathology Section meetings in Boston next December.

Dr. Clay is most active in the eye bank program in Oklahoma. It is his belief that if we can familiarize the lay population with corneal transplantation techniques that greater public support for this fine program can be elicited. It was also his hope that the film be made available for educational purposes at optometric schools, at meetings of Academy Chapters, and before other optometric groups.

We of the Academy applaud both the generosity and public spirit of Dr. Clay. For those interested in borrowing the film, it will be held by Dr. Monroe Hirsch of Ojai, California.

DECEMBER BEST CONVENTION MONTH

According to Ralph Barstow of the Optometric Extension Program staff, the uncontrolled flow of optometric practice results in the following percentage of the year's work being done in each of the below months:*

September	9.5	February	8.1
August	9.0	March	8.1
October	8.5	May	7.9
July	8.4	June	7.9
November	8.3	April	7.7
January	8.2	December	6.6

This is, of course, not exactly news, but it is why the American Academy of Optometry has its annual meeting in December.

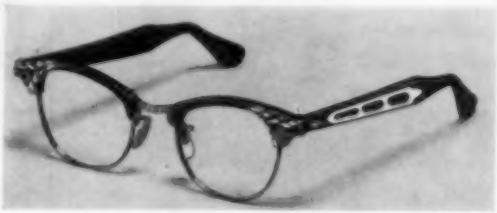
*Other decimal figures omitted.

OPTICAL FASHIONS IN THE NEWS

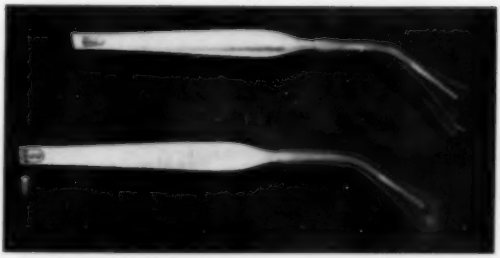
New Color, Trim and Temples Make Mansfram and Ladysfram the Last Word in Eyewear Fashion

Two strong and handsome new colors broaden the popular Mansfram's appeal to men. **Burnt Ash,** a smoky brown with black and gray stratas, can be worn equally well with blacks, charcoals, grays and browns. **Mahogany Briar** is a rich and masculine briar brown, livened with translucent bands of mahogany reds. Mansfram's seven colors and six temples, plus Tempeloc and Barreloc, give you a choice for every taste.

Ladysfram, dressed in conservative No. 23 Antique Endpiece Trim, is captivating new ranks of women. A tailored type of trim, 1/10 12K gold filled, the No. 23 is smart and elegant rather than sparkling and flashy. Looks well with the new Lurium temples or, as shown, with the No. 63 Deluxe temple. Choice of antique brown on mello, or antique blue or ebony on white.



New No. 62 all-Lurium Temple is pictured above on Mansfram. No. 65 Lurium Temple has crystal tips. Front and back views shown at right. Hinge countersunk in side for extra security and good looks. Equipped with new Tempeloc hinge pins as well as screws.



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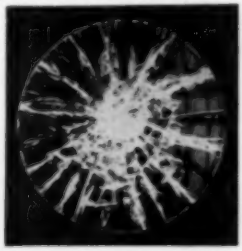

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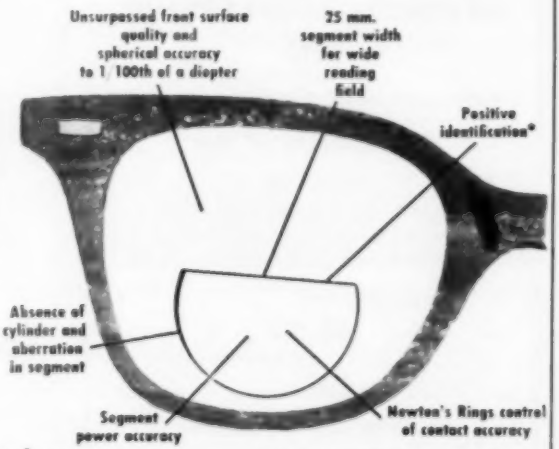
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